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THE
SEAMANS
SECRETS.

Devided into two Parts.

WHEREIN IS TAUGHT
the three kindes of Sayling, Hori-
zontall, Paradoxall, and Sayling upon
a great Circle.

Also an Horizontall Tyde-Table for the
true finding of the Ebbing and Flowing of the
Tydes, with a Regiment newly Calculated for
the finding of the Declination of the Sunne, and
many other most necessary Rules and In-
structions, not heretofore set forth by any.

Newly Corrected and amended, and the
first time Impreſſed.



LONDON
Printed by Iohn Dawson 1642

(2)

THE SEAMANS SECRETS

Divided into two Parts

WHEREIN IS CONTAINED

the three kinds of Sailing, Home,



a great Choice

Also an Horizontal Type-Table for the

finding of the Rising and Setting of the

Types, with a Regiment newly Calculated for

the finding of the Declination of the Sun, and

many other most necessary Rules and In-

struments, not heretofore set forth by any

Newly Corrected and amended, and the

first time Imprinted.



Printed by John Dawson, 1647
London

The Epistle Dedicatorie.

to he Majestie) was with a good resolution accepted by the Merchants of London, but in the decay of his honourable life, the attempt was likewise quailed: but howsoever mens mindes altar, yet undoubtedly there is passage navigable, and easie to be performed by that course (whensoever it shall please God to reveale the same) by invincible reasons and sufficient experience to be proved: and although before I entered into that discovery, I was sufficiently perswaded of the certaintie thereof, by historicall relation, substantially confirmed, whereof to the Adventurers I made sufficient prooffe, but especially to my worshipfull good friend Master *William Sanderfon*, the onely Marchant that to his great charges, with most constant travaile, did labour for the finishing thereof: yet I thanke God that of late it hath beene my very good chance, to receive better assurance then ever before of the certaintie of that passage, and such was my vehement desire for the performance thereof, that thereby I was only induced to go with *M. Candish* in his second attempt for the *South Seas*, upon his constant promise unto mee, that when we came to the *California*, I should there have his Pinnice with my owne Barke (which for that purpose went with mee to my great charges) to search that Northwest discovery upon those backe parts of *America*, but God hath otherwise disposed our purposes in his divine Iudgements, for Master *Candish* being halfe way through the Straights of *Magilane*, and impatient of the tempestious furiousnesse of that place, having all his Ships and company with him, returned for *Brasil*, by the the authority of his command, when with a leading wind we might have passed the same, and returning more then 80. leagues toward *Brasil*, my selfe being in his Ship named the *Desire* without Boats, Oares, Sailes, Cables, Cordage Victuals, or health of my Company sufficient for that attempt, was separated in a freit of weather, and forced to seek the next shore for my reliefe, and recovering a Harborow by us named *Port Desire*, being in the latitude of 48 degr. did there repaire my most miserable wants, and there staying foure months in most lamentable distresse did againe conclude with my Company, to give another attempt to passe the Straights, as my best meane to gaine reliefe. And three times I was in the *South Seas*, but still by furious weather forced backe againe: yet notwithstanding all this my labour to performe the Voyage to his profit, and to save my selfe (for I did adventure, and my good friends for my sake, 1100. pounds in the action) *M. Candish* was content to account me to be the author of his overthrow, and to write with
his

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this dying hand that I came from him, when that his owne Ship was returned many moneths before me.

I am bold to make this relation unto your Lordship, onely to satisfie your Honour of my conversation, for were I faultie of so foule a crime, I were worthy of ten thousand torments, in presuming to present this Treatise to your Honourable Lordship, and now referring my cause to your Lordships consideration, I will againe returne to my purpose.

In those Northwest voyages, where Navigation must be executed in most exquisite sort, in those attempts I was enforced to search all possible meanes required in sayling, by which occasion I have gathered together this briefe Treatise, which with my selfe I doe dedicate to your honourable protection, being desirous if it lay in my power to doe far greater matters in your Lordships service, hoping of your honorable pardon, because it is onely done to shew my dutifull affection, and not for any singularitie that the worke containeth. For I thinke there be many hundreds in *England* that can in a farre greater measure and more excellent methode expresse the noble art of Navigation, and I am fully perswaded that our Countrey is not inferiour to any for men of rare knowledge, singular explication, and exquisite execution of the *Arts Mathematicke*, for what strangers may be compared with *M. Thomas Diggs* Esquire, our Country-man the great Master of Arch masonry, and for Theoricall speculations and most cunning calculation, *M. Dee* and *M. Thomas Hariott* are hardly to be matched: and for the mechanicall practises drawne from the *Arts of Mathematicke*, our Countrey doth yeeld men of principall excellencie, as *M. Emery Mullenex* for the exquisite making of Globes-bodies, and *M. Nicholas Hellyar* for the singularitie of portraiture, have the praise of Europe, *M. Baker* for his skill and surpassing grounded knowledge for the building of Ships advantageable to all purposes, hath not in any Nation his equall.

And now that I may returne to the painfull Seaman, it is not unknowne to all Nations of the earth, that the English goeth before all others in the practises of sayling, as appeareth by the excellent discovery of *Sir Francis Drake* in his passage through the straights of *Magillan*, which being then so rashly knowne, he could not have passed, unless he had beene a man of great practise and rare resolution: so much I may boldly say, because I have seene and tasted the frowardnesse of the place, with the great unlikelihood of any passage to be that way.

I might here repeat the most valiant and excellent attempts of Sir

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Hugh Willoughbie, Sir *John Hawkins*, Sir *Humphrey Gilbert*, and your Lordships servant *M. George Raymond*, with diverse others that have given most resolute attempts, in the practises of Navigation, as well for the discovery as other execution, whereby good proofe is made, that not onely in the skill of Navigation, but also in the mechanickall execution of the practises of sayling, we are not to be matched by any Nation of the earth.

And such Navigation is the meane whereby Countries are discovered and communie drawne betweene Nation and Nation, the Word of God published to the blessed recovery of the forreigne off-casts, from whence it hath pleased his divine Majestie as yet to detaine the brightnesse of his glory: and that by Navigation Common-weales through mutuall trade are not onely sufficiently sustained, but mightily enriched; with how great esteeme ought the painefull Sea-man to be embraced, by whose hard adventures such excellent benefits are atchieved, for by his exceeding great hazzards, the forme of the earth, the quantities of Countries, the diversitie of Nations, and the natures of Zones, Climats, Countries and people, are apparantly made knowne unto us. Besides, the great benefits mutually interchanged betweene Nations, of such fruites, commodities, and artificiall practises, wherewith God hath blessed each particular country, coast, and Nation, according to the nature and scituation of the place.

For what hath made the *Spaniard* to be so great a Monarch, the Commander of both *Indias*, to abound in wealth and all natures benefits, but only the painefull industrie of his Subjects in Navigation, their former trade was onely figges, oringes, and oyle, but now through Navigation is brought to be gold, silver, pearles, silkes, and spice, by long and painefull trade recovered. Which great benefits only by her Majesties loving clemencie and mercifull favour he doth possesse: for if her Highnesse and her most honourable Lords would not regard the small distance betweene her dominions and those famous rich Kingdomes, the easinesse of the passage being once discovered (the Northwest I meane) with the full sufficiency of her highnesse Subjects to effect the same, these could then be no doubt, but her stately seape of *London* should be the storehouse of *Europe*, and a nurse to all Nations, in yelding all Indian commodities in a farre better condition, at a more easie rate then now brought unto us, exchanging commodities of our owne store, with a plentifull returne at the first hand, which now by many exchanges are brought unto us.

Then

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Then should the *Spaniard* againe returne to his old trade, and our Sacred Sovereigne be seated the Commander of the earth: which trade and most fortunate discovery, we above all nations ought most principally to regard, because of the singulartie and invincible force of our Shipping, which is not only the commanding Fortresse of our Countrey, but also the dread of our adversary, and the glory of our Nation: wherein we doe in no sort flatter our selves, for it was made apparant to all Nations of the earth, by the late most famous conquest that her Majesty had against the huge supposed invincible flecte of the *Spaniard*, being by her Navie under the command of your Lordship, who there in person and in place of her Majestie, to your eternall glorious fame did disgrace their glory and confound their force, and manifest their weaknesse by their dastardly flight, through Gods providence and your Lordships statelie resolution.

Then sith Navigation is a matter of so great moment, I suppose that every man is bound in duty to give his best furtherance thereunto: among whom as the most unmett of all, yet wishing all good to the painefull traveller, I have published this short Treatise, naming it the *Seamans Secrets*, because by certaine questions demanded and answered, I have not omitted any thing that appertaineth to the secret of Navigation, whereby if there may grow any increase of knowledge or ease in practise, it is the thing which I chiefly desire.

To manifest the necessary conclusions of Navigation in brieft and short tearmes, is my onely intent, and therefore I omit to declare the causes of tearmes and definition of artificiall words, as matter superfluous to my purpose, neither have I layd down the cunning conclusions apt for Schollers to practise upon the thore, but onely those things that are needfully required in a sufficient Seaman: beseeching your Honourable Lordship to pardon my boldnesse, and with your favourable countenance to regard my dutifull affection, I most humbly commit your good Lordship to the mercies of God, who long preserve your health, with continuall increase of honour.

From Sandrudge by Dartmouth
the 20. of August, 1594.

Your Lordships in all dutifull
service to Command,

JOHN DAVIS



JOH. DAVIES



THE FIRST BOOKE OF THE SEAMANS SECRETS.

What is Navigation?



Navigation is that excellent Art, which demonstrateth by infallible conclusions, how a sufficient Ship may be conducted the shortest and truest way from place to place, by Course and Tack.

What are these infallible conclusions?

Navigation consisteth of three parts, which being well understood and handled, are conclusions infallible, whereby the skillfull pilot is able of all doubt to effect the thing purposed. Of which, the first is the Horizontal Navigation, which maketh to know the varieties of the Ships motion within the Horizontal plane superficies, whereby how Nations is supposed a parallel.

The second is a Paradorall, or Cosmographical Navigation, which demonstrateth the true motion of the Ship upon any route assigned in longitude, latitude, and distance, either particular or generall, and is the skillfull gathering together of many Horizontal Courses, into one infallible and true motion Paradorall.

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The third is a great circle Navigation, which teacheth how up-
on a great Circle to draw between any two places assigned, (be-
ing the onely shortest way between place and place) the Ship may
be conducted, and is performed by the skillfull application of Hori-
zontall and Paradorall Navigation.

What is a Course ?

A Course is that Paradorall line which passeth betweene place
and place, according to the true Horizontall position of the
Magnet, upon which Line the Ship prosecuting her motion, shall
be conducted betweene the said places.

What is a Travers?

A Travers is the variety or alteration of the Shipp's motion
upon the shift of winde within any Horizontall plaine su-
pericies, by the good collection of which Traverses, the Shipp
uniforme motion or Course is given.

What Instruments are necessary for the execution
of this excellent skill ?

The Instruments necessary for a skillfull Seaman, are a Sea
Compass, a Cross staff, a Quadrant, an Astrolaby, a Chart
an Instrument Magnetick for the finding of the variation of the
Compass, an Horizontall plaine Sphære, a Globe, and a Para-
dorall Compass. By which Instruments, all conclusions and in-
fallible demonstrations, Hydrographickall, Cosmographickall, and
Cosmographickall, are without contrivance of error to be per-
formed; but the Sea Compass, Chart, and Cross staff, are in-
struments sufficient for the Seamans use: the Astrolaby and
Quadrant being Instruments very uncertaine for Sea observa-
tions.

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What is the Sea Compasse?

The Sea Compasse, is a principall instrument in Navigation representing and distinguishing the Horizon, so that the Compasse may conveniently be named an Artificiall Horizon, because by it are manifested all the limits and distinctions of the Horizon required to the perfect use of Navigation, which distinctions are the 32 points of the Compasse, whereby the Horizon is divided into 32 equal parts, and every of those points hath his proper name, as in the figure following appeareth. Also every point of the Compasse both contain degrees, minutes, seconds, and thirds, &c. Which degrees are called degrees of Azimuth, whereof there are in every point $1\frac{1}{2}$ so that the whole Compasse or Horizon containeth 360 degrees of Azimuth, for if you multiply $1\frac{1}{2}$ degrees, the degrees that each point containeth, by 32 the points of the Compasse, it yieldeth 360, the degrees of the Compasse. And of minutes each point containeth 45, being $\frac{1}{4}$ of an houre, so that the whole Compasse is hereby divided into 24 houres, by which account there are in an houre 15 degrees, so that every degree containeth 4 minutes of time, for an houre consisting of 60 minutes hath for his fiftieth part 4 minutes of time, and in every minute there is sixty seconds, and every second containeth sixty thirds, either in degrees applied to time, or degrees applied to measure: so that the generall content of the Compasse is 32 points, 363 degrees, and 24 houres, with their minutes, seconds, and thirds.

What is the use of the 32 points of the Compasse?

The use of the 32 points of the Compasse, is to direct the skillfull Pilots by Horizontall tracers, how he may conclude the Course or Paradoxall motion of his Ship, thereby with the greater expedition to reconer the place desired, because they divide the Horizon in such limits as are most apt for Navigation, they doe also distinguish the winde by their proper names, for the winde receiveth his name by that part of the Horizon from whence it bloweth,

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What is the use of 360. degrees of Azimuth?

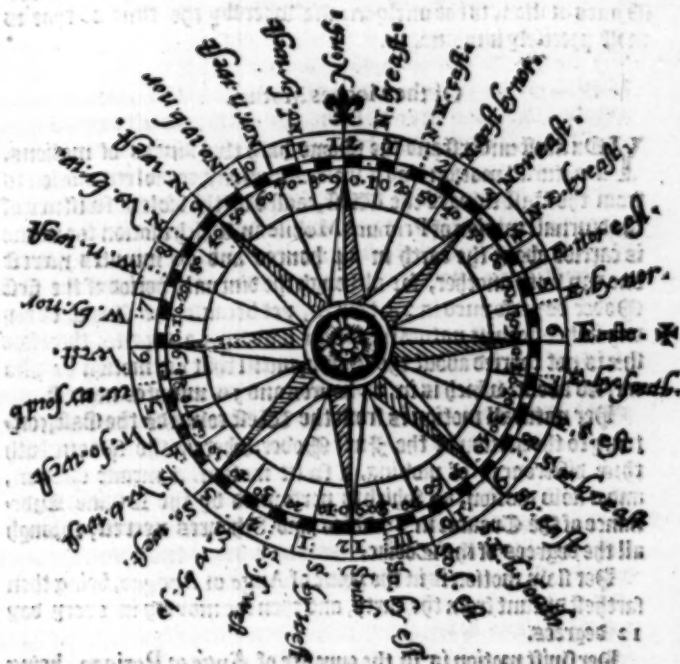
By the degrees of Azimuth is known the quantity of the rising and setting of the Sunne, Moone, and Starres, whereby is knowne the length of the dayes and nights in all climates, and at all times, they also shew a most precise Horizontall distinction of the motion of the Sunne, Moone, and Starres, whereby the certaintie of time is measured, and the variation of the Compasse, with the Poles height, is ingeniously knowne at all times, and in all places by the helpe of the Globe.

How is the houre of the day knowne by the Compasse?

It hath bene an ancient Custome among Mariners to divide the Compasse into 24. equall parts or houres, by which they have used to distinguish time, supposing an East Sunne to be 6. of the clock, a Southeast Sunne 9. of the clocke, and a South Sunne 12. of the clocke, &c. as in the figure following shall plainly appear. But this account is very absurd, for to say in England (the Sunne having his greatest North declination,) it is somewhat past 7. of the clocke, at an East Sunne, and at a Southeast Sunne it is past 10. of the clocke: also when the Sunne is in the Equinotiall, the Sunne is halfe the day East, and halfe the day West, to all those that be under the same; so that the Sunne then, and to those people useth but two points of the Compasse, to performe the motion of 12. houres: therefore the distinctions of time may not well be given by the Compasse, unless the Sunne be upon the Meridian, or that you be farre toward the North, in such places where the Sunnes Horizontall motion is very oblique, for there the houre may be given by the Compasse, without any great error, but else where it cannot. Therefore those that travell must either use the Globe, or an Equinotiall Diall, by which time may be most certainly measured, if there be good consideration of the variation of the Needle, by which the Equinotiall Diall is directed, for this is a generall thing to be regarded, as well in the Compasse, as in any Diall, or other instrument, or conclusion to be devised, touching the use of the Needle is required, that unlesse there be good regard unto the variation of the Needle, there can no good conclusion follow of any such practises.

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What is the next necessary thing to be learned?

Thing perfectly learned the Commaſſe, the next neceſſary thing for a Seaman to know, is the alteration of ſitting of Tides, that thereby he may with the greater ſafety bring his Ship into any barred Port, Haven, Crooke, or other place, where tides are to be regarded. And this difference of Tides in the alteration of flowing and reſlowing, is by long experience found to be governed by the Mooones motion, ſo in ſuch proportion of time as the Mooone doth ſeparate her ſelfe from the Sunne, by the ſlowing of her naturall motion: in the like proportion of time doth our Tide differ

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differ from another, therefore to understand this difference of the Moones motion, is the onely meane whereby the time of tyde is most precisely knowne.

Of the Moones Motion.

You must understand the Moone hath two kindes of motions, a naturall motion and a violent motion, her violent motion is from the East toward the West, caused by the violent swiftnesse of the diurnall motion of Primum Mobile in which motion the moone is carried about the earth in 24. houres and 50. minutes neereff one day with another, for although the diurnall period of the first Moone be performed in 24. houres, yet because the Moone every day in her slowest naturall motion moveth 12. degrees, therefore she is not carried about the Earth, untill that her motion be also carried about, which is in 24. houres and 50. minutes neereff.

Her naturall motion is from the West towards the East, contrary to the motion of the first Moone, wherein the Moone hath three differences of moving, a swift motion, a meane motion, and a slow motion, all which is performed by the Divine Ordinance of the Creator in 27. daies and 8. houres neereff, through all the degrees of the Zodiac.

Her slow motion is in the point of Auge or Apogeo, being then farthest distant from the earth, and then she moveth in every day 12. degrees.

Her swift motion is in the opposite of Auge or Perigeo, being neereff unto the earth, at which times shee moveth 14. degrees, with some small difference of minutes in every 24. houres.

Betweene those two points is her meane motion, and then shee moveth 12. degrees neereff: all which differences are caused by the eccentricity of her Orbe wherein shee moveth, and are onely performed in the Zodiac, but the Seamen for their better ease in knowledge of the Tides, have applied this the Moones motion to the points, degrees, and minutes of the Compass, whereby they have framed it to be an Horizontall motion, which although by long practice is found to be a rule of such certainty, as that the error thereof bringeth no danger to the expert Seaman, therefore it is not amisse to follow their practised precepts therein.

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In every 29 daies 12 houres 44 minutes, it is another through the year, the Sunne and Moone are in coniunction, and therefore that is the quantity of time betwene change and change, so; although the Moone in 27 daies and 8 houres, performing her naturall motion, doth returne to the same minute of the Zodiac from whence she departed, yet being so returned, shee doth not finde the Sunne in that part of the Ecliptick where shee left him, so; the Sunne in his naturall motion moving every day one degree towards the East, is moved so farre from the place where the Moone left him, as that the Moone cannot overtake the Sunne to come in Coniunction with him, untill she have performed the motion of 2 daies 4 houres, and 44 minutes more, then her naturall revolution, and that is the cause wherefore there are 29 daies 12 houres, 44 minutes betwene Change and Change one with another through the whole year: but the Seaman, accompteth the Moones motion to be uniforme in all places of the Zodiac alike, limiting her generall separation from the Sunne to be such as is her slowest naturall motion, which is 12 degrees, or 48 minutes of time, in every 24 houres.

Nowe which in compt there are 30 daies reckoned betwene Change and Change, being 24 houres, 18 minutes more then in truth there is: but because this difference breedeth but small error in their accompt of Tydes, therefore to alter practised Rules where there is no urgent cause, were a matter frivolous, which considered I thinke it not amiss that we proceede therein by the same method that commonly is executed.

Allotting the Moone in every 24 houres, to depart from the Sunne 12 degrees, or 48 minutes of time, and in this separation the Moone moveth from the Sunne Eastward, untill shee be at the full: so; betwene the change and the full, it is called the Moones separation from the Sunne: so; after the full, shee doth apply towards the Sunne, so that betwene the full and the change, it is called the Moones application to the Sunne, in which time of application shee is to the Westward of the Sunne, as in her separation shee is to the Eastward, or I may say in the Seamans phrase, all the time of her application shee is before the Sunne, and in the time of her separation shee is abaft the Sunne.

When if the Moone doe move 48 minutes of time in 24 houres,

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It followeth that the doth move 24. minutes in 12. houres, and in 6. houres the moeth 12. minutes, therefore every houre the moeth 2. minutes, and such as in the difference of her motion such is the alteration of tydes, and therefore every tyde differeth from the other 12. minutes; because there is 6. houres betwene tyde and tyde: and in every houre the course of flowing or refloving altereth 2. minutes, whereby it appeareth that in 24. houres the foure tydes of flowing and refloving doe differ 48. minutes of time.

And with the whole knowledge of this difference or alteration of tydes, as also the quantity of the Spooones separation and application to and from the Spume, dependeth upon the knowledge of the Spooones age, it is therefore necessary, that next you learne how the Spume may be knowne.

For the performance whereof there are two numbers especially required, named the Prime and the Exact, for by the Prime the Exact is found, and by helpe of the Exact the Spooones age is knowne.

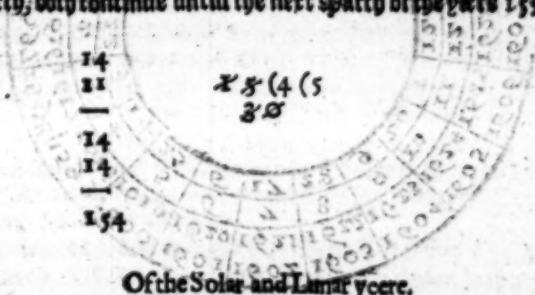
Of the Prime, or Golden Number.

The Prime is the part of 19. yeares, in which time the Spume hath exactly all the variation of her motion with the Spume, and at the end of 19. yeares beginneth the same revolution againe, therefore the Prime is ever expressed the number of 19. and this Prime with which we begin in January, and thus the Prime is found: unto the yeares of the Age wherein you desire to knowe the Prime, adde 1. then divide that number by 19. and the remaining number which cometh out here the quotient is the Prime: Example in the yeares of our Lord 1590. I desire to knowe the Prime, therefore I adde 1. unto that yeare, and then it is 1591. which I divide by 19. and it is 83 with the quotient 83. and there remaineth 14. upon the Division, which cometh not into the quotient, which 14. is the Prime in the yeares of our Lord 1590. and you may

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The Epact is a number proceeding from the overplus of the solar and lunar yeare, which number never exceedeth 30, because the Moones age never exceedeth 30. for the finding whereof this number onely serbet h: and thus the Epact is known, which Epact doth alwayes begin in March, multiply the prime by 11. (being the nearest difference between the solar and lunar yeare) divide the product by 30. and the remainder is the Epact. Example in the yeare of our Lord 1590. I would know the Epact, first I take the prime of that yeare, and find it to be 14. I therefore multiply 14. by 11. and that yeldeth 154. which being divided by 30. it giveth the quotient 5. and there remaineth 4. upon the division, which 4. is the Epact in the yeare 1594. which beginning in March, doth continue untill the next March of the yeare 1591.



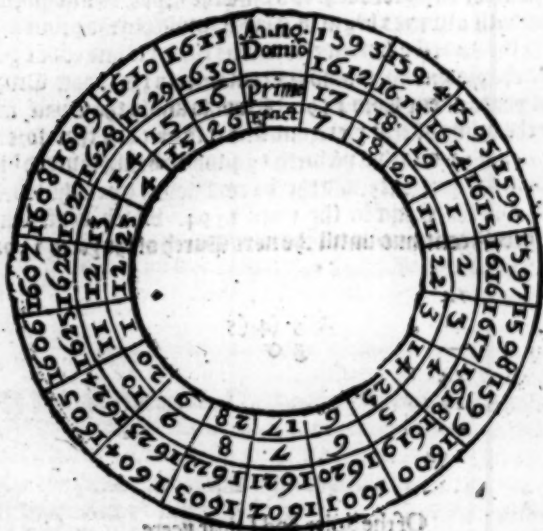
Of the Solar and Lunar yeere.

The Solar yeare, or the Suns yeare, consisteth of 12. moneths, being 365. dayes, and about 6. houres, the Lunar yeare or the Moones yeare containeth 12. Moones, and every Moone hath 29. dayes 12. houres, 44. minutes nearest, which amount unto 354. dayes, 5. houres, 28. minutes, the content of the Lunar yeare, which being subtracted from 365. dayes, 6. houres, there resteth 11. dayes and 23. minutes, the difference between the said yeeres, from which difference the Epact commeth.

Item the Epact of the year 1594 is 4. which being added to the Epact of the year 1590, which is 14, the sum is 18. which is the Epact of the year 1591. **E**nd

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By this Table the Prime and Epact may for ever be found, for when the yeeres be expired, you may begin againe and continue it for ever at your pleasure.



The first circle containeth the yeeres of our Lord, the second the Prime, and the third and inner circle sheweth the Epact: under every yeere you shall finde his Prime and Epact, the Prime beginneth in January, and the Epact in March.

How to finde out the Moones age.

First, consider the day of the moneth wherein you seek the Moones age, then note how many moneths there are between the said moneth and March, including both monethes, unto those numbers adde the Epact of that yeere, that is, you must adde into one summe the day of the moneth, between March & your moneth
retho,

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reckoning both moneths and the Cycle, all which numbers ioyned together, if they exceed not 30. is the moones age, if they be moze then 30 cast away 30. as often as you can, and the remainder is the moones age, if it be iust 30. it is then new moone, if 7 it is the first quarter day, if 15. it is full moone. If 22. it is then the last quarter day, and thus the moones age is found for ever.

And now being able for all times either past, present, or to come to give the moones age, I thinke it good by a few questions convenient for the Seamans practise, to make you understand the necessary use thereof.

For the account of Tydes.

When you desire to know the time of full Sea in any place at all such seasons as occasion shall require, you must first learn what moon maketh a full Sea in the same place, that is, upon what point of the Compasse the moone is, when it is full Sea at the said place, you must also know what houre is appropriated to that point of the Compasse, as before is shewed: for upon the change day it will alwayes be full Sea in that place, at the same instant of time, by which considerations you must thus proceede for the search of tydes.

Multiply the moones age by 4. divide the product by 5. and to the quotient adde the houre, which maketh full Sea in that place upon the change day, if it exceede 12. cast away 12. as oft as you may, and then the houre of full Sea remaineth and for every 1. that resteth upon your division, allow 12. minutes to be added to the houre, for 2. 24. minutes, for 3. 36. and for 4. 48. minutes, for moze then 4. will never remaine, & thus you may know your Tydes to a minute, Example. the moon being twelve dayes old, I desire to know the time of full Sea at London: first it is found by experience, that a Southwell & North-east moone makes full Sea at London, next I consider that 3. of the clocke is the houre appropriated to that point of the Compasse, which number I keep in memorie, then I multiply the moones age, being 12. by 4. and that yieldeth 48. which being divided by 5. it giueth in the quotient 9. and 3. remaineth, I adde the quotient 9. to the houre 3. and it maketh 12. houres, and for the remaining number 3. I also add

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46. minutes, so that I finde when the Moone is 12. dayes old, it is 12. of the clock and 36. minutes past, at the instant of the full Sea at London: by this order you may at all places and times know the certainty of your tydes at your pleasure.

But those that are not practised in Arithmetick, may account these tydes in this sort, knowing how many dayes old the Moone is, he must place the Moone upon that point of the Compasse which maketh full Sea at the place desired, and then reckoning from that point with the Sun according to the diurnall motion, must account so many points, and so many times 3. minutes as the moone is dayes old, that is, for every day one point and three minutes, and there finding the Sunne, he must consider what is the houre allowed to that point where he findeth the Sunne, for that is the houre of full Sea. As for Example, the Moone being 12. dayes old, I desire to know the houre of full Sea at London, now finding by former experience, that a South-west Moone maketh full Sea at London, I therefore place the Moone upon the point South-west, then I account from the point South-west 12. points, reckoning with the Sunne according to the diurnall motion, South-west and by west for the first point, West South-west for the second, West by South for the third, West for the fourth point, and so forth, untill I come to North, which is 12. points from the South-west, and because the Moone moveth 3. minutes more then a point in every day, I therefore adde 3. times twelue which make 36. minutes to the point North, at which place I find the Sunne to be, and knowing that 12. of the clocke is appointed to the point North. I may therefore boldly say that at twelue of the clocke 36. minutes past, it is full Sea at London, when the Moone is twelue dayes old, which 36. minutes are added, because the Moone hath moved 36. minutes more then 12. points in those 12. dayes, which is one point and 3. minutes for every day, as before.

Here followeth a very necessary Instrument
for the knowledge of the Tydes, named

an Horizontall Tyde-Table.

The Seamans Secrets.

Of this Instrument and his parts.

This necessary instrument for the young practising Seamans use, named an Horizontal Tyde-Table, whereby he may shift his Sunne and Moone (as the terme is) and know the time of his tides with ease and very certainly; besides the answering of many pleasant and necessary questions used amongst Mariners) I have contrived into this method, onely for the benefit of such young practisers in Navigation.

The first part of this Instrument is a Sea Compass, divided into 32. points, or equall parts, the inferior circle of which Compass is divided into 24. houres, and every of those into 4. quarters, each quarter being 15. minutes, and against every point of the Compass those places are laid downe, in which places it is full Sea when the Moone continueth upon the same point, so that whatsoever is required as touching time, or the points of the Compass is there to be knowne.

The next moveable circle upon this Compass, is limited to the Sunne, upon whose Index the Sunne is layd downe, which circle is divided into 30. equall parts or dayes, signifying the 30. dayes between change and change, according to the Seamans account, so that whatsoever is demanded as touching the age of the Moone, is upon that circle to be knowne.

The uppermost moveable circle is applied to the Moone, upon whose Index the Moone is layd downe, which is to be placed either to the points and parts of the Compass; or to the time of her age, as the question requireth. which considered, the use of this Instrument is largely manifested, by these questions with their answers following.

How to know the houre of the night by the Moone, being upon any point of the Compass by this Instrument.

1. Q. The Moone 10. dayes old, I demand what is a clocke, when she is East North-east?

1. A. In this question the Moones age and the point of the Compass is given, thereby to know the houre, I therefore place the

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the Index of the moone upon the point East Southeast, there keeping the same not to be moved, then because the moon is 10. dayes old, I move the Index of the Sun untill I bring the 10th day of the moones age unto the Index of the moone, and there I look by the Index of the Sun, and finde upon the Compass that it is twelbe of the clocke at noon and 30. minuts past, when the moon is upon the point East Southeast, being 10. dayes old.

2. Q. The moon being twelbe dayes old, I demand at what houre she will be upon the point S. S. E.?

2. A. In this question the point of the Compass and moones age is given as in the first, therefore I place the Index of the moone upon the point S. S. E. And there holding it without moving, I turne the Index of the Sun, untill the twelfth day of the moones age come to the Index of the moon, and then the Index of the Sun sheweth me upon the Horizon the houre 8. therefore I say that at 8. of the clocke at night, the moone was then upon the point South Southeast.

And thus you may at all times know the houre of the night by the moone, upon any point of the Compass, so that the moones age be also had.

How by this Instruction, you may know at all times upon what point of the Compass the Moone is.

1. Q. When the moone is 10. dayes old, upon what point of the Compass shall she be at 9. of the clocke in the morning?

1. A. In this question the houre of the day and the moones age is given, thereby to finde upon what point of the Compass she is at the same time. I therefore place the Index of the Sun upon the Compass, at the houre 9. of the clocke in the morning, being upon the point Southeast, then I turne the Index of the Moone untill I bring it to the tenth day of her age, and then I look upon the Compass, that the moon is north and by East, and 17. min. to the Eastwards, of 9. of the clocke when she is 10. dayes old.

2. Q. When the moone is 20. dayes old, upon what point of the Compass will she be at 2. of the clock in the afternoone?

2. A. I place the Index of the Sun upon the houre 2. noted in the Compass, there holding the same without moving, then I turne

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turne the Index of the Moone, untill I bring it unto the 30. day of her age, and there I see upon the Compasse that she is South, east and by north, and 15 minutes to the northward, at 2. of the clocke in the afternone, when she is 30. dayes old.

To finde the Moones age by this Instrument.

1. Q. When the Moone is South at 7. of the clocke in the afternone, how old is she?

1. A. In this question the point of the Compasse and the houre is given, soz the finding of the Moones age: therefore I set the Index of the Sunne upon the houre 7 in the forenone, there holding it without moving, then I bring the Index of the Moone to the point South and then upon the circle containing the dayes of the Moones age. I see the Moone is 8. dayes and about 18. houres old, when she is South at 7. of the clock in the forenone.

2. Q. When the Sun is East and the Moone Southeast, how old is the Moone?

2. A. In this question the points of the Compasse are onely given soz the finding of the Moones age, therefore I set the Index of the Sun upon the point East, there holding him steady, then I put the Index of the Moone upon the point Southwest, and there I see that the moone is 18. dayes and 18. houres old, when the Sun is East and she Southwest.

After this order by the varietie of these few questions, you may frame unto your selfe many other pleasant and necessary questions, which are very easily answered by this Instrument: and entering into the reasons of their answers, you may very readily by a little practise, be able by memorie to answer all such questions with ease.

How to know the time of your tydes by this Instrument.

1. Q. When the moone is 12. dayes old, I desire to know the time of full Sea at London.

1. A. To answer this question, I first looke through all the points of the Compasse of my Instrument; untill I finde where London is written, soz when the moon commeth upon the point
of

The Sealmans Secrets:

of the Compasse, it will then be full sea at London: therefore I place the Index of the Spone upon the same point, which I finde to be South-west or North-east, there holding the Index not to be moved, then I turne the Index of the Sunne untill I bring the twelfth day of the Spones age to the Index of the Spone, and then the Index of the Sunne sheweth me that at 12. of the clocke 36. minutes past, it is full sea at London, the Spone being 12. dayes old.

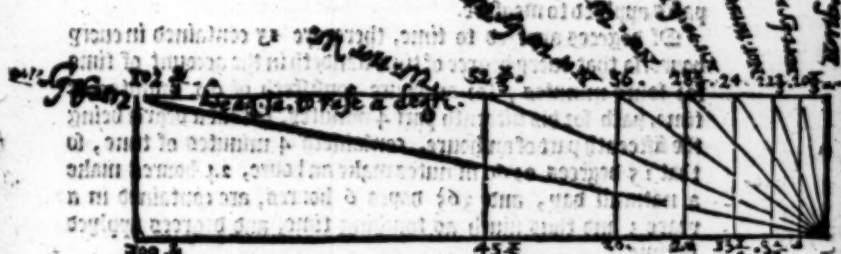
2. Q. The Spone being 21. dayes old, at what time is it full sea at Dartmouth.

A. I finde upon my Instrument that Dartmouth is noted upon the points East and West, whereby I know that when the Spone is East or West, it is alwayes full sea at Dartmouth: therefore I place the Index of the Spone upon the point East, and there holding it without moving, I turne the Index of the Sunne, untill I bring the 21. day of the Spones age unto the Index of the Spone, and then the Index of the Sunne sheweth me upon the Compasse, that at 10. of the clocke and 48. minutes past, it is full sea at Dartmouth, when the Spone is 21. dayes old, and not onely at Dartmouth, but my Instrument sheweth me that at the same instant it is full sea at Exmouth, Weymouth, Plymouth, Mounts Bay, at Linne, and at Hamber: and thus with great facilitie the time of flowings and reflowings is most precisely knowne.

And now that there may be a small end of the uses and effects of the Compasse, it is convenient that I make knowne unto you how many leagues shall be sayled upon every particular point of the Compasse, for the raising or laying of the degrees of latitude, and in the distance sayling how farre you shall be separated from the Meridian from whence the said courses are begun, for as every point of the Compasse hath his certaine limited distance for the degrees of the Poles elevation, so do they likewise lead from longitude to longitude, every point according to his ratable limits, which distances of leagues are without alteration, keeping one and the same proportion in every particular position of any latitude, but the degrees of longitude answerable to such distances, doe differ in every altitude, according to the nature of the parallel, as hereafter shall be more plainly manifested. And now

knowe that in sayling North and South, you depart not from your
Meridian, and in every 30 leagues sayling you raise a degree :
North and by East raiseth a degree in sayling 30 leagues and
one mile, and leadeth from the Meridian 4 leagues : North
east raiseth a degree in sayling 31 leagues and two miles, leadeth
from the Meridian 8 leagues and one mile : Northeast by North,
raiseth a degree in sayling 32 leagues, and leadeth from the Me-
ridian 13 leagues and a mile : Northeast raiseth a degree in say-
ling 33 leagues and a mile, and leadeth from the Meridian 20
leagues : Northeast by East raiseth a degree in sayling 35 leagues
and leadeth from the Meridian 30 leagues : East Northeast raiseth
a degree in sayling 35 leagues and a mile, and leadeth from the
Meridian 38 leagues and 3 miles : East and by North raiseth a
degree in sayling 36 leagues and a mile, and leadeth from the
Meridian 40 leagues and 3 miles : East and North doe not raise
at this the Pole, but keepeth still in the same parallel: the like of
leagues is to be given to every quarter of the Compass, as is
also written upon this present quarter.

at North East 30 leagues and one mile
at North 31 leagues and two miles
at North West 32 leagues
at West 33 leagues and a mile
at West South 35 leagues
at South West 35 leagues and a mile
at South 38 leagues and 3 miles
at South East 40 leagues and 3 miles
at East South 40 leagues and 3 miles
at East 40 leagues and 3 miles
at East North 36 leagues and a mile
at North East 35 leagues and a mile
at North 35 leagues and one mile
at North West 33 leagues and one mile
at West 32 leagues and one mile
at West South 31 leagues and two miles
at South West 30 leagues and one mile
at South 30 leagues and one mile
at South East 30 leagues and one mile
at East South 30 leagues and one mile
at East 30 leagues and one mile
at East North 30 leagues and one mile
at North East 30 leagues and one mile



Leagues separated from the Meridian in raising a degree.

Q. I perceive that degrees are of great purpose in Navigation.

What is a degree?

Ans. It is most true, that degrees are of very great use in Navigation, and a degree is the 360 part of a circle, how big or little sooner the circle be, being applied after this

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severall sorts, for the better partitions of the practices. Suber-
nautick, so that there be degrees of longitude, degrees of lati-
tude, degrees of Azimuth, degrees of altitude, degrees applied to
measure, and degrees applied to time.

1. A degree of longitude is the 360 part of the Equinoctiall.

2. A degree of latitude is the 360 part of the Meridian.

3. A degree of Azimuth is the 360 part of the Compasse, or Ho-
rizon.

4. A degree of altitude is the 90 part of the verticall circle, or the
90 part of the distance betwene the Zenith and the Horizon.

5. Every degree applied to measure, doth containe 60 minutes,
and every minute 60 seconds, and every second 60 thirds, &c. and
every degree of a great circle so applied, containeth 20 leagues,
which is 60 miles, so that every minute standeth for a time in
the account of measures, and a mile is limited to be 1000 paces,
every pace six foot, every foot tenne inches, and every inch three
barly cornes dry and round, after our English account, which for
the use of Navigation is the only best of all other, so by these
rates of measure you may prove that a degree is 20 leagues, or
60 miles, a minute is a mile, or 5000 feet, a second is 83 ffeete,
and a third is 16 f inches: and thus much of degrees and their
parts applied to measure.

Of degrees applied to time, there are 24 contained in every
houre, so that every degree of time standeth in the account of time
for foure minutes, for an houre consisteth of 60. minutes of
time, both for his fiftieth part 4 minutes, so that a degree being
the fiftieth part of an houre, containeth 4 minutes of time, so
that 15 degrees, or 60 minutes make an houre, 24 houres make
a naturall day, and 365 dayes 6 houres, are contained in a
yeare: and thus much as touching time, and degrees applied
to time.

What is the use of degrees?

The use of degrees is to measure distance betwene place and
place, to finde altitudes, latitudes, and longitudes, to describe
Countries, to distinguish coastes, to finde the variation of the
Compasse, to measure time, to finde the places and motions of

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all celestiall bodies, as the sunne, moone, planets, and starres; to conclude, by degrees haue been performed all Mathematicall obseruations to purpose, whose use is infinite.

What is the Poles altitude, and how it may be knowne?

Altitude is the distance, height, or mounting of one thing aboue another, so that the altitude of the Pole, is the distance, height, or mounting of the Pole from the Horizon, and is defined to be that portion of the Meridian which is contained betwene the Pole and the Horizon, which altitude or elevation is to bee found either by the sunne, or by the fixed starres, with the helpe of your Crosse Staffe, Quadrant, or Astrolabe, but the Crosse Staffe is the onely best Instrument for the Seamans use.

And in the obseruation of this altitude there are five things especially to be regarded: the first is, that you know your Meridionall distance betwene your Zenith and the same or starres, which by your Crosse Staffe or Astrolabe is giuen: the second, that the declination be truely knowne at the time of your obseruation, And the other three are, that you consider whether your Zenith be betwene the Equinoctiall and the same or starres, or whether the Equinoctiall be betwene your Zenith and them, or whether they be betwene your Zenith and the Equator, for there is a feuerall order of working upon each of these three differences.

Latitude you must also know, that so much as the Pole is aboue the Horizon, so much is the Zenith from the Equinoctiall, and this distance betwene the Zenith and the Equator is called latitude or widenesse, and is that portion of the Meridian which is included betwene your Zenith and the Equator, for it is a generall rule for euer, that so much as the Pole is aboue the Horizon, so much the Zenith is from the Equinoctiall, so that in this sence, altitude and latitude is all one thing, the one having relation to that part of the Meridian, contained betwene the Pole and the Horizon, and the other to that part of the Meridian which is contained betwene the Zenith and the Equinoctiall.

You must further understand, that betwene the Zenith and Horizon, it is a quarter of a great circle containing 90. degrees

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So that knowing how much the Summe of any Starre is from the Horizon, if you take that distance from 90. the remainder is the distance betwene the said body and the Zenith. As for example; if the Summe be 40 degrees 37 minutes from the Horizon, 3 subtract 40 de gr. 37 minutes from 90 and there remaineth 49 degrees 23 minutes, which is the distance between my Zenith and the Sun, &c. Those instruments that begin the account of their degrees at the Zenith, concluding 90 at the Horizon, are of most call for the finding of the latitude by the Summe of fixed Starre, because they give the distance between the Zenith and the body observed without further trouble, and that is the number which you must take, and for which you see search in your observation: all which things considered, you must in this last process by the Sighting of the poles be kept in altitude.

By the Summe of fixed Starres being between the Zenith and the Horizon, the latitude is thus found, in what part of the world soever you be.

First, place the Cross-staff in your eye, in such good light as that there may be no error by the darkness: using therefore the middle of the Center of your staff, and the Center of your staff how joined together in your observation, it will be necessary that you conclude thereby: your want to observe, then move the transitory upon your staff to and fro as occasion requireth, until at one and the same instant you may see by the upper edge of your transitory, half the body of the Summe of Starres, and that the lower edge, and there see the same thing the Horizon, at that place where it seemeth that the stile and lines are joined, having especial regard in this your observation, as that you hold the transitory as directly upright as possible you may, and you must beginne this observation sometime before the Summe of Starre be at Noon, and continue the same so long as you perceive that they rise: for when they are at the highest, then are they upon the Equator, and then you have the Equatorial altitude which you seek, at which time they will be due South from you, if you change the place and without variation, and then hold the transitory with upon the stile.

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the degrees and minutes that the said pole is from your Zenith, if the degree of your Zenith count be measured from the Zenith toward the Horizon: as also at length the distance between the said pole and the Horizon, if the degree of your Zenith count be numbered from the Horizon, consisting so in the Zenith, or some way in the distance as was before said, which is not the case here: but if your Zenith be accounted from the Horizon, then add first the degree of your Zenith from the Horizon, and then subtract the distance between your Zenith and the South celestial Pole, which is the number yourself finding, with that number so added together your Zenith, and the distance of the pole, by which you shall observe, together with the distance away before said, that which cometh by the addition of these three numbers together, is the Poles height, or the latitude of the place where you are: as for example: On the tenth of our March 1671, the third day of March, the Sunne being then betwixt my Zenith and the Equinoctiall, I observed the Sunnes Meridionall altitude from the Horizon to be 73 degrees 20 minutes, but because I must know the distance of the Sunne from my Zenith, I therefore subtract 73 degrees 20 minutes from 90 degrees, and there remaineth 17 degrees 40 minutes, the distance of the Sun from my Zenith, to that distance I add the Sunns declination for that day, which by my Instrument I found to be 43 minutes 45 degrees of South declination; and it cometh thus 60 degrees 25 min. so much is the South Pole above the Horizon, and so much is my Zenith south from the Equinoctiall; because the Sunne being South declination, was being between the meridian and the Equinoctiall, the height of reaching the South celestial Pole must include my Zenith, also the distance of the said Sun from the Zenith, and the distance of the Zenith from the Equinoctiall, which is the Sunns declination, as is shown in the second altitude of the Sun, and the Poles height.

When the Equinoctiall is between your Zenith and the South celestial Pole, the altitude is thus found in all places.

Beethoven's distance of the "Moon" is between them, you see.

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which being knowne, subtract the declination of the Sonne
from the said distance, and the remaining number is
the Poles height, or latitude which you seek: Example.

The 10 of October 1623 I find by my Instrument that the
Sun is 60 degrees 45 minutes from my Zenith at noon, being
then upon the Meridian, the Equator being then between my Ze-
nith and the Sun, I also find by my Instrument that at that time
the Sun has 13 deg. 57 min. of South declination, because the
Equinoctiall is betwene me and the Sonne, therefore I subtract
the Sunnes declination from the observed distance, and there re-
steth 46 degrees 48 minutes, the latitude desired; and because the
Sonne hath the South declination, and the Equinoctiall being be-
tweene me and the Sonne, therefore I may conclude that the
Pole Arctike is 46 degrees 48 minutes above my Horizon, or that
my Zenith is so much toward the South from the Equator;

When you are in the Tropics, or between the Equator and the
Poles, and the Sun is between you and the Equator, you must
subtract the Sunnes declination from the observed distance, and
the remaining number is the latitude desired: Example. The 10 of
October 1623 I find by my Instrument that the Sun is 60 degrees
45 minutes from my Zenith at noon, being then upon the Meridian,
the Equator being then between my Zenith and the Sun, I also find
by my Instrument that at that time the Sun has 13 deg. 57 min.
of South declination, because the Equinoctiall is betwene me and
the Sonne, therefore I subtract the Sunnes declination from the
observed distance, and there resteth 46 degrees 48 minutes, the
latitude desired; and because the Sonne hath the South declina-
tion, and the Equinoctiall being betwene me and the Sonne, there-
fore I may conclude that the Pole Arctike is 46 degrees 48 mi-
nutes above my Horizon, or that my Zenith is so much toward
the South from the Equator;

When your Zenith is betwene the Equator and the Poles, and
the Sun is between you and the Equator, you must subtract the
Sunnes declination from the observed distance, and the remain-
ing number is the latitude desired: Example. The 10 of October
1623 I find by my Instrument that the Sun is 60 degrees 45 mi-
nutes from my Zenith at noon, being then upon the Meridian,
the Equator being then between my Zenith and the Sun, I also find
by my Instrument that at that time the Sun has 13 deg. 57 min.
of South declination, because the Equinoctiall is betwene me and
the Sonne, therefore I subtract the Sunnes declination from the
observed distance, and there resteth 46 degrees 48 minutes, the
latitude desired; and because the Sonne hath the South declina-
tion, and the Equinoctiall being betwene me and the Sonne, there-
fore I may conclude that the Pole Arctike is 46 degrees 48 mi-
nutes above my Horizon, or that my Zenith is so much toward
the South from the Equator;

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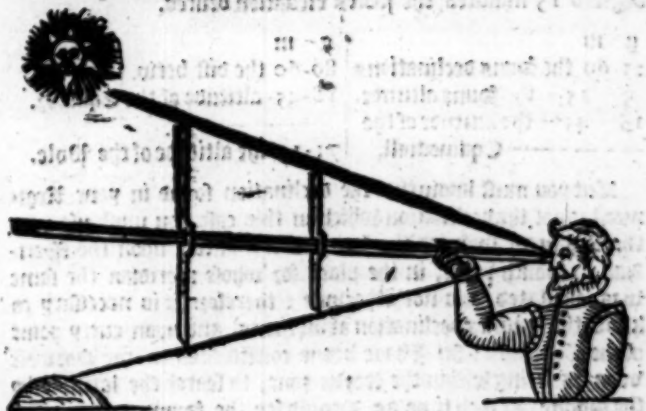
g m

12-40- the Declination
5-9- the Sunnes distance from my Zenith.

14-51- the Boles height.

How shall I know the true order of placing the Crosse-staff:
to mine eye, to avoid error in my observation?

To finde the true placing of the Staffe as your eye, thereby to
amend the parallax, or false shadow of your Sight, doe thus:
take a Staffe having two crosses, a long crosse which endeth in
30 degrees, and a short crosse which beginneth at 30 degr. where
the long crosse endeth, put the long crosse upon his 30 degree and
there make him fast, then put the short crosse likewise upon his
30 degrees, there fasten him without moving, then let the end of
your Staffe to your eye, moving it from place to place about your
eye, untill at one instant you may see the ends of both crosses,
which when you finde, remember that place and the standing of
your body, so to make your Staffe be placed, and your body ordered
in all your observations.



Are


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Are these all the rules that appertaine to the finding
of the Poles height.

Those that travell farre towards the North, under whose
Horizon the Sunne setteth not, shall sometime have occasi-
on to find the latitude by the Sunne, when the Sunne is North
from them, the Pole being then betwixt the Sunne and their
Zenith. When such observations are made, you must by your
Instrument take the Sunnes height from the Horizon, subtract
that height from his declination, and the remaining number be-
cometh how farre the Equinoctiall is above the Horizon from the point
North, for so much is the distance of the Equator from
the Horizon near the point North, whence that declination is
latitude of the Equinoctiall from 90 and the remaining number is
the Poles height desired: *Example.*

The Sunne being 22 degrees of North declination, his alti-
tude from the Horizon is observed to be 2 degrees 15 minutes,
therefore his distance 2 degrees 15 minutes from 22 degrees there
rest 18 degrees 45 minutes, which is the distance of the Equinoctiall
from the Horizon, which being taken from 90, there resteth 71
degrees 15 minutes, the Poles elevation desired.

g m
21-60 the Sunns declination
3-15 the Sunns altitude.
18-45 the altitude of the
Equinoctiall.

g m
89-60 the dist. betw. 
18-45 altitude of the Equator,
71-15 the altitude of the Pole.

But you must know that the declination found in your Regi-
ment is not the declination which in this case you must use, for
the Regiment sheweth the Sunnes declination upon the Peri-
dian or South point, in the place so; whose meridian the same
was calculated, and not otherwise: therefore it is necessary to
know the Sunnes declination at all times, and upon every point
of the Compass: so; I have beene constrained in my farthest
voyages, being within the frozen zone, to search the latitude by
the Sunne, at such time as I could see the Sunne, upon what
point of the Compass heer, by reason of the great fogges and
mistes

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misses that those Southerne parts are subject unto: and there is consideration also to be had upon every difference of longitude for the sunnes Declination, as I haue by my experience found at my being in the Straights of Magilane, where I haue found the sunnes Declination to differ from my Regiment calculated for London, by so much as the sun declineth in five houres, for so much is the difference betwene the Perioian of London, and the Perioian of Cape Froward, being in the midst of the said Straights.

How may this declination be found for all times, and upon
all points of the Compasse.

First, consider whether the sunne be comming towards the Equinoctiall, or going from him, that being knowne, consider the time wherein you seeke the declination, then looke for the sunnes Declination in your Regiment for that day, and also seek his declination for the next day, subtract the lesser out of the greater, and the remainder is the whole declination which the sunne declineth in 24. houres, or in his moving through all the points of the Compasse, from which number you may by the rule of proportion finde his declination upon euery point of the Compasse for every houre of the day, as by these examples, may appeare: Example.

In the yeare 1625. the 20. of March, I desire to knowe the sunnes declination when he is upon the South part of the Perioian of London, I seeke the sunnes declination for that day, and finde it to be 3. deg. 59. min. the sun then going from the Equator, I also search his declination for the next day, being the 21. of March, and finde it to be 4. deg. 22. min. I then subtract 3. deg. 59. min. from 4. deg. 22. min. and there resteth 23. min. so much the sunne doth declineth in 24. houres, or in going through all the points of the Compasse. Then I say by the rule of proportion, if 24. houres giue 23. minutes of declination, what will 12. houres giue, &c. I multiply and diuide, and finde it to be 11. min. 30. sec. the sunnes declination in 12. houres motion to be added to the declination of the 20. day, being the sunnes going from the Equator, or for the points of the Compasse, I may say,

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if 32. points give 22. min. of declination, what will 16. points give, which is the distance betwixne South and North? I multiply and divide as the rule of proportion requireth, and find that 16. points give 11. min. the sunnes declination, in mooving through 16. points of the Compass, which is to be added to the declination of the 20. day, because the sun goeth from the Equator, so I conclude the declination to be 3. deg. 52. min. the sun being north the 20. of march.

In this work
the 30. seconds are
omitted.

ho. mo. ho.

24—22—12—11

13

44

8

22

8

8

8

364

8

po. m. po. m.

32—22—16—11

16

132

3

22

8

8

352

8

Being West from the meridian of London 90. degrees of longitude, I desire to know the suns declination when the sun is upon the meridian the 20. of March 1625. I must here consider that 90. deg. of longitude makes 6. houres of time, for everyhoure containeth 15. deg. whereby I know that when the sunne is south at London, he is but east from me, for when it is 12. of the clocke at London, it is but 6. of the clocke in the morning with me, and when it is 12. of the clocke with me, it is then 6. of the clocke in the afternoone at London: therefore I must take for the declination of the sun at 6. of the clocke in the afternoone, and that is the meridionall declination which I must use being 90. deg. West from London, which to doe, the last example teach sufficiently teach you, whereby you may easily gather the perfect notice of what is order to require in any of these kinde of observations; if you reade with the speed of reason, and labour to understand with iudgement that which you reade.

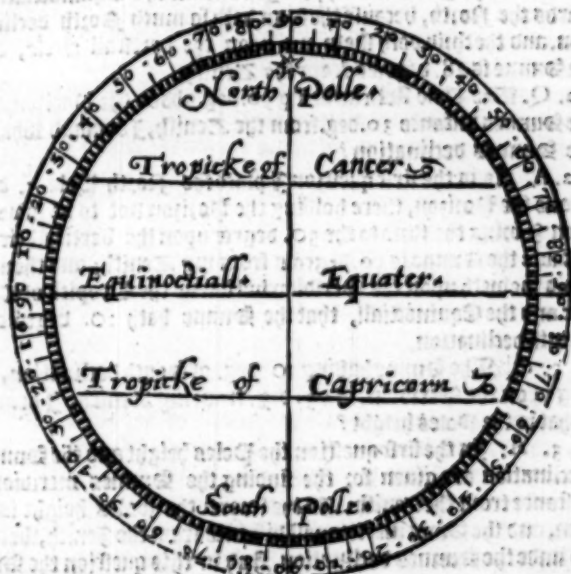
Example. The day and yeare proposed being the 20. of March 1625. declination the 3. deg. 59. min. the next day 21. of March 4. 0. 22. min. Deduction made, resteth 23. min. the proportionall part to be found for 90. deg. West, in 6. houres of time? Day is 24. houres give 23. What 6. houres? Each 5. min. 18. seconds, which

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which being that the declination encreaseth, adde 5. min. 18. sec. to the declination for the day prefixed: that totall is the meridional declination for 90. deg. of westerly longitude from the meridian of London.

There is another way most excellent for the finding of the sunnes declination at all times, that is to search by the Ephemerides the sunnes true place in the Eccipticke for any time proposed whatsoever, and then by the Tables of Sinus the declination is thus knowne: multiply the Sinus of the suns longitude from the Equinoctiall points of Aries or Libra, to which soever he is nearest, by the Sinus of the suns greatest declination, and divide the product by the whole Sinus, and the arke of the quotient is the declination desired: but because seamen are not acquainted with such calculations, I therefore omit to speake further thereof, with this plaine way before taught: is sufficient for their purpose.



The Seamans Secrets!

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The Use of this Instrument.

By this Instrument you may sufficiently understand, the reasons of whatsoever is before spoken for the finding of the Poles elevation, or the latitude of your being: into the confirmation whereof because the young practiser may the better enter, I thinke it not amiss by a few examples to expresse the necessity use thereof.

Q. The Sun being seven degrees of North declination and the Pole Articke being 45. degrees above the Horizon, I demand what will be the Sunnes Meridionall distance from my Zenith.

A. First I turne the Horizon untill I bring the North Pole to be 45. degrees above the same, there holding the Horizon not to be moved, I then bring the thrid that is fasted to the Center of the Instrument, 7. degrees from the Equinoctiall towards the South, because the Sun hath so much North declination, and the thrid both shew me upon the verticall circle, that the Sunne is 38. degrees from the Zenith.

2. Q. The Pole Articke being 50. deg. above the Horizon, and the Sunnes distance 30. deg. from the Zenith, I demand what is the Sunnes declination?

A. As in the first question I place the North Pole 5. deg. above the Horizon, there holding the Horizon not to be moved, then I bring the thrid to the 30. degree upon the verticall circle, because the Sunne is 30. degrees from my Zenith, and then the thrid sheweth upon the Meridian betwene the Tropick of Cancer and the Equinoctiall, that the Sunne hath 20. degrees of North declination.

3. Q. The Sunne having 10. deg. of South declination, being upon the Meridian, is 53. deg. from my Zenith, I demand what is the Poles height?

A. In the first question the Poles height and the Sunnes declination are given for the finding the Sunnes meridionall distance from the Zenith: In the second the Poles height is given, and the Sunns meridionall distance from the Zenith, thereby to finde the Sunnes declination. And in this question the Sunns declina.

declination and meridionall distance is given for the finding of the Poles height. I therefore bring the third fastned in the Center of the Instrument 10. degrees South from the Equator, betwene the Equinotiall and the Tropicke of Capricorne, there holding the third not to be moved, I then turne to the Horizon untill I bring the 53. degree of the verticall circle under the third and then the Horizon sheweth me, that the South Pole is 43. degrees above the same.

4. Q The Sunne having 12. degrees of South declination, and being upon the Meridian South from me, is 30. degrees above the Horizon, I demand how farre the Sunne is from my Zenith, how much the Equinotiall is above the Horizon, and what is the Poles height?

4. A. First, I bring the third to the place of the Sunnes declination as before, there holding it not to be moved, then I turne the Horizon untill I bring it to be 30. deg. under the third, and then the third sheweth me that the Sunne is 60. deg. from my Zenith, and the Horizon sheweth that the Equinotiall is 42. deg. above the same, and that the South Pole is also elevated 48. deg. above the Horizon although these questions are so very easie and plaine, as that they may readily be answered by memory, yet because the reasons how they are answered may the better appeare, is the cause wherefore they are demanded, and in this sort answered onely for the benefit of such as are not altogether expert in these practices, that thereby they might likewise frame unto themselves questions of other varietie, and so gather thereby the more sufficient indgement in this part of Navigation.

What is the Zenith?

The Zenith is that ptecke or point in the heavens which is directly over your head, from whence a line falling perpendicularly, will touch the place of your being, and so passe by the Center of the sphere, and this line may be called the Axis of the Horizon, and the Zenith the Pole of the same, being 90. d. from all parts thereof, as by the former figure may most plainly appear.

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The use of the Regiment.



Orasmuch as the Poles height cannot be observed by the Sunne, unlesse the Sunnes true declination bee knowne, I have therefore carefully calculated these Tables or Regiment, out of *O-riganus*, for the yeares 1625. 6. 7. and 8. which will serve untill the yeere 1644. without further correction; and because there may grow no error by mistaking the yeares, I have over every Moneth written the yeare of the Lord, in which the declination of the same Moneth is to be used, therefore when in any yeare and Moneth you seeke the Sunnes declination, first looke for the moneth, and there you shall finde 4. of those Moneths, which are the Moneths between the leape yeares, then looke over each of those moneths, untill you find the yeare of the Lord, wherein you seeke the declination, and directly under that yeare is the Moneth wherein you must seeke the Suns declination; Example 1626. the tenth day of Feb. I would know the Suns declination, first I seeke out February, & under the second yeare I see the yeare 1626, therefore this is my Moneth, against the tenth day of which Moneth I find that the Sun hath 10. deg. 49. min. of South declination, and after the like manner you must do in all the rest as occasion requireth.

January

January.

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First.	Second.	Third.	Fourth.
1625	1626	1627	1628
1629	1630	1631	1632
1633	1634	1635	1636
1637	1638	1639	1640
1641	1642	1643	1644
D.G.M.	D.G.M.	D.M.M.	D.G.M.
1 21 47	1 21 49	1 21 51	1 21 54
2 21 37	2 21 39	2 21 41	2 21 44
3 21 27	3 21 29	3 21 31	3 21 34
4 21 16	4 21 18	4 21 21	4 21 24
5 21 5	5 21 7	5 21 10	5 21 13
6 20 52	6 20 56	6 20 59	6 21 2
7 20 41	7 20 44	7 20 47	7 20 50
8 20 29	8 20 32	8 20 35	8 20 38
9 20 17	9 20 19	9 20 22	9 20 25
10 20 4	10 20 6	10 20 9	10 20 12
11 19 20	11 19 59	11 19 56	11 19 59
12 19 37	12 19 35	12 19 42	12 19 46
13 19 21	13 19 20	13 19 18	13 19 22
14 19 1	14 19 5	14 19 14	14 19 18
15 18 52	15 18 50	15 18 59	15 19 3
16 18 37	16 18 34	16 18 44	16 18 48
17 18 21	17 18 25	17 18 28	17 18 33
18 18 5	18 18 9	18 18 13	18 18 17
19 17 49	19 17 53	19 17 57	19 18 1
20 17 32	20 17 36	20 17 40	20 17 44
21 17 15	21 17 19	21 17 23	21 17 28
22 16 58	22 17 2	22 17 6	22 17 11
23 16 41	23 16 45	23 16 49	23 16 53
24 16 23	24 16 27	24 16 31	24 16 36
25 16 5	25 16 9	25 16 13	25 16 18
26 15 47	26 15 51	26 15 55	26 16 0
27 15 28	27 15 32	27 15 36	27 15 42
28 15 9	28 15 13	28 15 18	28 15 23
29 14 50	29 14 55	29 14 59	29 15 4
30 14 31	30 14 35	30 14 40	30 14 45
31 14 12	31 14 16	31 14 20	31 14 26

South Declination.

South Declination.

South Declination.

Februarie.

First.		S. cond.		Third.		Fourth.
1625		1626		1627		1628
1629		1630		1631		1632
1633		1634		1635		1636
1637		1638		1639		1640
1641		1642		1643		1644
D.G.M.		D.G.M.		D.G.M.		D.G.M.
1 13 51	South Declination.	1 13 56	South Declination.	1 14 00	South Declination.	1 14 15
2 13 31		2 13 36		2 13 40		2 13 55
3 13 09		3 13 15		3 13 20		3 13 35
4 12 50		4 12 55		4 13 00		4 13 14
5 12 29		5 12 34		5 12 39		5 12 54
6 12 08		6 12 14		6 12 19		6 12 33
7 11 48		7 11 53		7 12 48		7 12 12
8 11 26		8 11 31		8 11 36		8 11 50
9 11 5		9 11 10		9 11 15		9 11 29
10 10 43		10 10 49		10 10 54		10 11 7
11 10 21		11 10 27		11 10 32		11 10 45
12 10 00		12 10 05		12 10 10		12 10 23
13 9 36		13 9 43		13 9 48		13 10 1
14 9 15		14 9 21		14 9 26		14 9 39
15 8 53		15 8 58		15 9 4		15 9 16
16 8 30		16 8 36		16 8 43		16 8 53
17 8 8		17 8 14		17 8 19		17 8 31
18 7 45		18 7 51		18 7 56		18 8 8
19 7 22		19 7 28		19 7 33		19 7 45
20 6 59		20 7 5		20 7 10		20 7 13
21 6 36		21 6 42		21 6 47		21 6 58
22 6 13		22 6 19		22 6 24		22 6 35
23 5 50		23 5 56		23 6 1		23 6 12
24 5 27		24 5 32		24 5 38		24 5 48
25 5 3		25 5 9		25 5 15		25 5 24
26 4 40		26 4 46		26 4 51		26 5 0
27 4 16		27 4 22		27 4 28		27 4 17
28 3 53		28 3 58		28 4 4		28 4 13
						29 3 49

March.

First.		Second.		Third.		Fourth.
1625		1626		1627		1628
1629		1630		1631		1632
1633		1634		1635		1636
1637		1638		1639		1640
1641		1642		1643		1644
D. G. M.		D. G. M.		D. G. M.		D. G. M.
1 3 29		1 3 55		1 3 41		1 3 23
2 3 6		2 3 11		2 3 17		2 3 0
3 2 43		3 2 48		3 2 53		3 2 35
4 2 19		4 2 24		4 2 30		4 2 18
5 1 55		5 2 0		5 2 6		5 1 49
6 1 31		6 1 37		6 1 43		6 1 31
7 1 7		7 1 13		7 1 19		7 1 1
8 0 43		8 0 49		8 0 55		8 0 38
9 0 10		9 0 26		9 0 31		9 0 14
10 0 4		10 0 3		10 0 8		10 0 10
11 0 27		11 0 21		11 0 16		11 0 34
12 0 51		12 0 45		12 0 40		12 0 57
13 1 15		13 1 9		13 1 3		13 1 21
14 1 38		14 1 33		14 1 27		14 1 44
15 2 2		15 1 56		15 1 50		15 2 8
16 2 25		16 2 20		16 2 14		16 2 32
17 2 49		17 2 43		17 2 37		17 2 55
18 3 13		18 3 7		18 3 10		18 3 19
19 3 36		19 3 30		19 3 21		19 3 42
20 3 59		20 3 53		20 3 48		20 4 5
21 4 22		21 4 15		21 4 11		21 4 28
22 4 43		22 4 19		22 4 34		22 4 51
23 5 8		23 5 3		23 4 57		23 5 14
24 5 31		24 5 16		24 5 20		24 5 37
25 5 54		25 5 49		25 5 43		25 6 0
26 6 17		26 6 12		26 6 6		26 6 23
27 6 39		27 6 34		27 6 29		27 6 45
28 7 2		28 6 56		28 6 51		28 7 9
29 7 23		29 7 19		29 7 14		29 7 10
30 7 47		30 7 42		30 7 36		30 7 53
31 8 9		31 8 4		31 7 58		31 8 15

South Declination.

Equi.

North Declination.

South Declination.

Equi.

North Declination.

South Declination.

Equi.

North Declination.

April.

First.	Second.	Thrd.	Fourth.
1625	1626	1627	1628
1629	1630	1631	1632
1633	1634	1635	1636
1637	1638	1639	1640
1641	1642	1643	1644
D.G.M.	D.G.M.	D.G.M.	D.G.M.
1 8 38	1 8 25	1 8 20	1 8 37
2 8 53	2 8 48	2 8 42	2 8 59
3 9 15	3 9 9	3 9 4	3 9 31
4 9 36	4 9 31	4 9 25	4 9 42
5 9 58	5 9 53	5 9 47	5 10 4
6 10 19	6 10 14	6 10 9	6 10 25
7 10 40	7 10 35	7 10 30	7 10 46
8 11 1	8 10 36	8 10 51	8 11 7
9 11 22	9 11 17	9 11 12	9 11 27
10 11 42	10 11 37	10 11 32	10 11 48
11 12 13	11 11 58	11 11 53	11 12 8
12 12 22	12 12 18	12 12 13	12 12 28
13 12 43	13 12 38	13 12 23	13 12 48
14 13 2	14 12 58	14 12 53	14 13 7
15 13 22	15 13 17	15 13 11	15 13 27
16 13 43	16 13 37	16 13 32	16 13 47
17 14 1	17 13 56	17 13 51	17 14 6
18 14 19	18 14 5	18 14 10	18 14 25
19 14 38	19 14 24	19 14 20	19 14 43
20 14 56	20 14 52	20 14 48	20 15 1
21 15 15	21 15 10	21 15 6	21 15 20
22 15 33	22 15 28	22 15 24	22 15 37
23 15 50	23 15 46	23 15 41	23 15 55
24 16 8	24 16 3	24 15 59	24 16 12
25 16 25	25 16 20	25 16 16	25 16 29
26 16 42	26 16 37	26 16 33	26 16 46
27 16 58	27 16 54	27 16 49	27 17 3
28 17 14	28 17 11	28 17 7	28 17 19
29 17 30	29 17 26	29 17 23	29 17 35
30 17 46	30 17 42	30 17 38	30 17 50

North Declination.

North Declination.

North Declination.

May.

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First	Second.	Third.	Fourth.
1625	1626	1627	1628
1629	1630	1631	1632
1633	1634	1635	1636
1637	1638	1639	1640
1642	1643	1643	1644
D.G.M.	D.G.M.	D.M.M.	D.G.M.
1 18 22	1 17 58	1 17 54	1 18 6
2 18 17	2 18 13	2 18 10	2 18 21
3 18 32	3 18 28	3 18 24	3 18 36
4 18 46	4 18 43	4 18 39	4 18 50
5 19 0	5 18 57	5 18 54	5 19 4
6 19 14	6 19 11	6 19 8	6 19 18
7 19 28	7 19 25	7 19 21	7 19 32
8 19 41	8 19 38	8 19 35	8 19 45
9 19 54	9 19 51	9 19 48	9 19 57
10 20 7	10 20 3	10 20 0	10 20 10
11 20 19	11 20 16	11 20 13	11 20 23
12 20 31	12 20 28	12 20 25	12 20 34
13 20 42	13 20 39	13 20 37	13 20 45
14 20 53	14 20 51	14 20 48	14 20 56
15 21 4	15 21 2	15 20 59	15 21 7
16 21 15	16 21 12	16 21 10	16 21 18
17 21 25	17 21 23	17 21 20	17 21 28
18 21 35	18 21 30	18 21 30	18 21 37
19 21 44	19 21 42	19 21 40	19 21 46
20 21 53	20 21 51	20 21 49	20 21 55
21 22 2	21 22 0	21 21 58	21 22 4
22 22 10	22 22 8	22 22 6	22 22 12
23 22 18	23 22 6	23 22 13	23 22 20
24 22 25	24 22 23	24 22 22	24 22 27
25 22 33	25 22 31	25 22 29	25 22 34
26 22 39	26 22 37	26 22 30	26 22 41
27 22 45	27 22 4	27 22 42	27 22 47
28 22 51	28 22 50	28 22 48	28 22 53
29 22 57	29 22 56	29 22 54	29 22 58
30 23 2	30 23 1	30 22 59	30 23 3
31 23 7	31 23 6	31 23 4	31 23 8

North Declination.

North Declination.

North Declination.

June.

First.	Second.	Third.	Fourth.
1625	1626	1627	1628
1629	1630	1631	1632
1633	1634	1635	1636
1637	1638	1639	1640
1641	1642	1643	1644
D.G.M.	D.G.M.	D.M.M.	D.G.M.
1 23 11	1 23 10	1 23 9	1 23 12
2 23 15	2 23 14	2 23 13	2 23 16
3 23 18	3 23 17	3 23 17	3 23 19
4 23 21	4 23 21	4 23 20	4 23 22
5 23 24	5 23 23	5 23 23	5 23 25
6 23 26	6 23 26	6 23 25	6 23 27
7 23 28	7 23 28	7 23 27	7 23 29
8 23 30	8 23 29	8 23 29	8 23 30
9 23 31	9 23 30	9 23 30	9 23 30
10 23 31	10 23 31	10 23 31	10 23 31
11 23 31	11 23 31	11 23 31	11 23 31
12 23 31	12 23 31	12 23 31	12 23 31
13 23 31	13 23 31	13 23 31	13 23 30
14 23 30	14 23 30	14 23 30	14 23 29
15 23 28	15 23 29	15 23 29	15 23 28
16 23 26	16 23 27	16 23 27	16 23 26
17 23 24	17 23 25	17 23 25	17 23 23
18 23 21	18 23 22	18 23 23	18 23 21
19 23 18	19 23 9	19 23 20	19 23 17
20 23 15	20 23 16	20 23 17	20 23 14
21 23 11	21 23 12	21 23 13	21 23 10
22 23 7	22 23 8	22 23 9	22 23 5
23 23 2	23 23 3	23 23 4	23 23 0
24 23 57	24 23 58	24 23 59	25 23 55
25 23 51	25 23 53	25 23 54	26 23 50
26 23 45	26 23 47	26 23 48	27 23 44
27 23 39	27 23 41	27 23 42	28 23 37
28 23 33	28 23 34	28 23 36	29 23 31
29 23 25	29 23 27	29 23 29	30 23 23
30 23 18	30 23 20	30 23 22	31 23 16

July.

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First.	S cond.	Third.	Fourth.
1625	1636	1627	1628
1629	1636	1631	1632
1633	1634	1635	1636
1637	1638	1639	1640
1641	1642	1643	1644
D.G.M.	D.G.M.	D.G.M.	D.G.M.
1 22 10	1 22 12	1 22 14	1 22 18
2 22 2	2 22 4	2 22 6	2 22 9
3 21 53	3 21 55	3 21 57	3 21 51
4 21 44	4 21 46	4 21 49	4 21 42
5 21 35	5 21 37	5 21 40	5 21 34
6 21 25	6 21 28	6 21 30	6 21 22
7 21 15	7 21 18	7 21 20	7 21 12
8 21 5	8 21 7	8 21 10	8 21 2
9 20 54	9 20 56	9 20 59	9 20 51
10 20 43	10 20 45	10 20 48	10 20 40
11 20 31	11 20 34	11 20 37	11 20 28
12 20 19	12 20 21	12 20 25	12 20 16
13 20 7	13 20 10	13 20 13	13 20 4
14 19 55	14 19 58	14 20 2	14 19 51
15 19 43	15 19 45	15 19 49	15 19 38
16 19 29	16 19 32	16 19 36	16 19 25
17 19 15	17 19 18	17 19 22	17 19 2
18 19 1	18 19 5	18 19 9	18 18 58
19 18 47	19 18 51	19 18 55	19 18 43
20 18 33	20 18 36	20 18 41	20 18 29
21 18 18	21 18 22	21 18 26	21 18 14
22 18 3	22 18 7	22 18 11	22 17 59
23 17 48	23 17 51	23 17 57	23 17 43
24 17 32	24 17 36	24 17 40	24 17 28
25 17 16	25 17 20	25 17 24	25 17 12
26 17 0	26 17 4	26 17 9	26 16 56
27 16 43	27 16 47	27 16 52	27 16 39
28 16 27	28 16 31	28 16 36	28 16 22
29 16 10	29 16 14	29 16 19	29 16 5
30 15 52	30 15 57	30 16 2	30 15 48
31 15 35	31 15 39	31 15 44	31 15 30

North Declination.

North Declination.

North Declination.

Augst.

First.	Second.	Third.	Fourth.
1 6 2 5	1 6 2 6	1 6 2 7	1 6 2 8
1 6 2 9	1 6 3 0	1 6 3 1	1 6 3 2
1 6 3 3	1 6 3 4	1 6 3 5	1 6 3 6
1 6 3 7	1 6 3 8	1 6 3 9	1 6 4 0
1 6 4 1	1 6 4 2	1 6 4 3	1 6 4 4
D.G.M.	D.G.M.	D.G.M.	D.G.M.
1 15 17	1 15 21	1 15 26	1 15 12
2 14 59	2 15 4	2 15 8	2 14 54
3 14 41	3 14 45	3 14 50	3 14 36
4 14 22	4 14 27	4 14 31	4 14 17
5 14 4	5 14 8	5 14 13	5 13 59
6 13 45	6 13 49	6 13 54	6 13 39
7 13 25	7 13 30	7 13 35	7 13 20
8 13 5	8 13 10	8 13 15	8 13 1
9 12 47	9 12 51	9 12 56	9 12 41
10 12 37	10 12 33	10 12 36	10 12 21
11 12 7	11 12 12	11 12 16	11 12 1
12 11 47	12 11 51	12 11 56	12 11 41
13 11 35	13 11 31	13 11 36	13 11 20
14 11 6	14 11 11	14 11 16	14 11 0
15 10 45	15 10 51	15 10 55	15 10 39
16 10 24	16 10 19	16 10 34	16 10 18
17 10 13	17 10 8	17 10 13	17 9 57
18 9 42	18 9 47	18 9 52	18 9 36
19 9 20	19 9 25	19 9 31	19 9 14
20 8 59	20 9 4	20 9 9	20 8 53
21 8 37	21 8 42	21 8 48	21 8 31
22 8 15	22 8 21	22 8 26	22 8 9
23 7 53	23 7 58	23 8 4	23 7 47
24 7 31	24 7 37	24 7 42	24 7 35
25 7 9	25 7 15	25 7 20	25 7 3
26 6 47	26 6 52	26 6 57	26 6 40
27 6 24	27 6 30	27 6 35	27 6 18
28 6 2	28 6 8	28 6 12	28 5 55
29 5 39	29 5 45	29 5 56	29 5 33
30 5 16	30 5 22	30 5 27	30 5 10
31 4 58	31 4 59	31 5 4	31 4 47

North Declination.

North Declination.

North Declination.

September.

First.		Second.		Third.		Fourth.
1625		1636		1627		1628
1639		1630		1631		1632
1633		1634		1635		1636
1637		1638		1639		1640
1641		1642		1643		1644
D. G. M.		D. G. M.		D. G. M.		D. G. M.
1 436	North Declination.	1 436	North Declination.	1 441	North Declination.	1 424
2 418		2 413		2 419		2 411
3 344		3 350		3 355		3 338
4 321		4 327		4 332		4 315
5 254		5 34		5 39		5 252
6 235		6 240		6 246		6 228
7 217		7 217		7 223		7 25
8 144		8 154		8 159		8 141
9 135		9 111		9 16		9 118
10 17		10 17		10 113		10 95
11 028	Equi-	11 043	noti-	11 049	the	11 032
12 014		12 00		12 026		12 035
13 010		13 04		13 02		13 016
14 033		14 027		14 022		14 040
15 056		15 051		15 045		15 13
16 120		16 114		16 19		16 127
17 143		17 138		17 132		17 150
18 27		18 1		18 156		18 214
19 231		19 235		19 219		19 237
20 254		20 248		20 243		20 30
21 217	South Declination.	21 311	South Declination.	21 36	South Declination.	21 324
22 341		22 315		22 330		22 37
23 44		23 358		23 353		23 411
24 428		24 422		24 416		24 434
25 451		25 445		25 440		25 457
26 514		26 58		26 53		26 520
27 537		27 532		27 526		27 544
28 60		28 555		28 549		28 67
29 623		29 618		29 612		29 629
30 646		30 641		30 635		30 632

October.

First.	Second.	Third.	Fourth.
1625	1626	1627	1628
1629	1630	1631	1632
1633	1634	1635	1636
1637	1638	1639	1640
1641	1642	1643	1644
D.G.M.	D.G.M.	D.G.M.	D.G.M.
1 7 9	1 7 4	1 6 58	1 7 15
2 7 32	2 7 16	2 7 21	2 7 38
3 7 54	3 7 49	3 7 44	3 8 1
4 8 17	4 8 12	4 8 6	4 8 23
5 8 39	5 8 34	5 8 28	5 8 54
6 9 2	6 8 56	6 8 51	6 9 8
7 9 24	7 9 18	7 9 13	7 9 30
8 9 46	8 9 40	8 9 35	8 9 52
9 10 8	9 10 2	9 9 57	9 10 14
10 10 29	10 10 34	10 10 19	10 10 53
11 10 51	11 10 46	11 10 41	11 10 57
12 11 12	12 11 7	12 11 2	12 11 18
13 11 34	13 11 28	13 11 23	13 11 39
14 11 55	14 11 49	14 11 44	14 12 0
15 12 15	15 12 11	15 12 5	15 12 21
16 12 36	16 12 31	16 12 26	16 12 42
17 12 57	17 12 52	17 12 47	17 13 2
18 13 17	18 13 11	18 13 6	18 13 22
19 13 37	19 13 32	19 13 27	19 13 43
20 13 57	20 13 52	20 13 47	20 14 2
21 14 16	21 14 12	21 14 7	21 14 22
22 14 36	22 14 30	22 14 26	22 14 41
23 14 55	23 14 50	23 14 40	23 15 0
24 15 14	24 15 10	24 15 5	24 15 19
25 15 33	25 15 28	25 15 24	25 15 38
26 15 51	26 15 47	26 15 42	26 15 56
27 16 9	27 16 5	27 16 0	27 16 14
28 16 27	28 16 23	28 16 19	28 16 32
29 16 45	29 16 41	29 16 36	29 16 49
30 17 2	30 16 58	30 16 54	30 17 7
31 17 19	31 17 15	31 17 11	31 17 24

South Declination.

South Declination.

South Declination.

November.

47

First.	Second.	Third.	Fourth.
1625	1626	1627	1628
1629	1630	1631	1632
1633	1634	1635	1636
1637	1638	1639	1640
1641	1642	1643	1644
D.G.M.	D.G.M.	D.G.M.	D.G.M.
1 17 30	1 17 32	1 17 28	1 17 40
2 17 51	2 17 48	2 17 44	2 17 57
3 18 8	3 18 5	3 18 1	3 18 13
4 18 24	4 18 20	4 18 17	4 18 28
5 18 40	5 18 36	5 18 32	5 18 44
6 18 55	6 18 51	6 18 47	6 18 59
7 19 10	7 19 6	7 19 2	7 19 13
8 19 24	8 19 21	8 19 17	8 19 28
9 19 38	9 19 35	9 19 31	9 19 42
10 19 52	10 19 48	10 19 45	10 19 56
11 20 5	11 19 52	11 19 59	11 20 9
12 20 18	12 20 15	12 20 12	12 20 21
13 20 31	13 20 28	13 20 25	13 20 34
14 20 43	14 20 40	14 20 37	14 20 46
15 20 55	15 20 52	15 20 49	15 20 58
16 21 6	16 21 4	16 21 1	16 21 9
17 21 17	17 21 15	17 21 12	17 21 10
18 21 28	18 21 26	18 21 23	18 21 31
19 21 38	19 21 36	19 21 33	19 21 41
20 21 48	20 21 46	20 21 43	20 21 51
21 21 58	21 21 56	21 21 53	21 22 0
22 22 7	22 22 4	22 22 2	22 22 9
23 22 15	23 22 13	23 22 11	23 22 17
24 22 23	24 22 21	24 22 19	24 22 25
25 22 31	25 22 29	25 22 27	25 22 33
26 22 38	26 22 36	26 22 35	26 22 40
27 22 45	27 22 43	27 22 42	27 22 47
28 22 51	28 22 50	28 22 48	28 22 53
29 22 57	29 22 56	29 22 54	29 22 59
30 23 3	30 23 1	30 23 0	30 23 4

South Declination.

South Declination.

South Declination.

December.

First.	Second.	Third.	Fourth.
1 6 25	1 6 2 6	1 6 2 7	1 6 2 8
1 6 29	1 6 3 0	1 6 3 1	1 6 3 2
1 6 33	1 6 3 4	1 6 3 5	1 6 3 6
1 6 37	1 6 3 8	1 6 3 9	1 6 4 0
1 6 41	1 6 4 2	1 6 4 3	1 6 4 4
D. G. M.	D. G. M.	D. G. M.	D. G. M.
1 23 8	1 23 6	1 23 5	1 23 9
2 23 12	2 23 11	2 23 10	2 23 13
3 23 16	3 23 15	3 23 14	3 23 17
4 23 20	4 23 19	4 23 18	4 23 21
5 23 23	5 23 22	5 23 21	5 23 24
6 23 25	6 23 25	6 23 24	6 23 26
7 23 28	7 23 27	7 23 27	7 23 28
8 23 29	8 23 29	8 23 29	8 23 30
9 23 30	9 23 30	9 23 30	9 23 31
10 23 31	10 23 31	10 23 31	10 23 31
11 23 31	11 23 31	11 23 31	11 23 31
12 23 31	12 23 31	12 23 31	12 23 31
13 23 30	13 23 31	13 23 31	13 23 30
14 23 29	14 23 30	14 23 30	14 23 29
15 23 28	15 23 28	15 23 29	15 23 27
16 23 26	16 23 26	16 23 27	16 23 25
17 23 23	17 23 24	17 23 24	17 23 22
18 23 20	18 23 21	18 23 22	18 23 19
19 23 17	19 23 17	19 23 18	19 23 15
20 23 13	20 23 14	20 23 14	20 23 11
21 23 8	21 23 9	21 23 10	21 23 7
22 23 3	22 23 4	22 23 6	22 23 2
23 22 58	23 22 59	23 23 0	23 22 56
24 22 52	24 22 53	24 22 55	24 22 50
25 22 46	25 22 47	25 22 49	25 22 44
26 22 39	26 22 40	26 22 42	26 22 37
27 22 32	27 22 33	27 22 35	27 22 30
28 22 24	28 22 26	28 22 28	28 22 22
29 22 16	29 22 18	29 22 20	29 22 14
30 22 7	30 22 9	30 22 12	30 22 5
31 21 58	31 22 1	31 22 3	31 22 56

South

South

South

Tro-

picus.

Cancer

Declination.

Declination.

Declination.

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What is the Chart?

The Sea Chart is a speciall instrument for the Seemans use, whereby the Hypozographickall description of the Ocean Seas, with the answering Geographickall limits of the earth, are supposed to be in such sort given, as that the longitudes and latitudes of all places, with the true distance and course betwene place and place, might be truly knowne. But because there is no proportionable agreement betwaine a Globus superficies, and a plaine superficies, therefore a Chart doth not expresse that certaintie of the premises which is thereby pretended to bee given, for things are best described upon bodies agreeable to their owne forme. And whereas in the true nature of the Sphere, there can be no Parallels described but the East and West courses onely, the rest of the courses being concurred lines, ascendent toward the Poles, the Meridians all concurring and ioyning together in the Poles, notwithstanding in the Sea Chart all those courses are described as Paralles, without any diversitie, alteration or distinction to the contrary, whereby the instrument is aparantly faulty: yet it cannot be denied but Charts for short courses are to very good purpose for the Pilots use, and in long courses be the distance never so farre, if the Pilot returne by the same course, whereby in the first he prosecuted his voyage, his Chart will bee without error, as an Instrument of very great commoditie, but if he returne by any other way, then by that which he went forth, the imperfections of the Chart will then appeare to be very great, especially, if the voyage be long, or that the same be in the North parts of the world, the farther towards the North, the more imperfect: therefore there is no Instrument answerable to the Globe or paradoxall Chart, for all courses and climates whatsoever, by whom all declared truth is most plentifully manifested, as shall hereafter at large be declared, but for the coasting of any Shore or Countrey, or for short Voyages, there is no Instrument more convenient for the Seemans use, then the well described Sea Chart.

What is the use of the Sea-Chart.

By the directions of the Sea Chart the skilfull Pilot conveyeth his Shippe from place to place, by such courses as by the
Chart

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Chart are made knowne unto him, together with the helpe of his Compasse or Crosse staffe, as before is shewed, for the Crosse staffe the Compasse, and the Chart, are so necessarily ioyned together, as that the one may not well be without the other in the execution of the practises of Navigation: for as the Chart sheweth the courses, so doth the Compasse direct the same, and the Crosse staffe by every particular obserued latitude doth confirme the truth of such courses, and also giue the certaine distance that the Ship hath sayled upon the same.

And in the use or understanding of the Sea Chart, there are five things chiefly to be regarded.

The first is, that the Countries, or Geography of the Chart be knowne, with every Cape, Promontorie, Port, Haven, Bay, Sands, Rocks, and dangers therein contained.

Secondly, that the lines be knowne upon the Chart, with their severall properties be likewise understood.

Thirdly, that the latitudes of such places as are within the Chart, be also knowne, as by the Chart they are expressed.

Fourthly, that you be able to measure the distances betwene place and place upon the Chart.

And fifthly, the Seaman must be able by his Chart, to know the true courses between any Isles, Continents, or Capes whatsoever: for by these five diversities, the Chart is to be used in the skill of Navigation.

How is the latitude of places knowne by the Chart?

The latitude is thus found by the Chart, upon the place whose latitude you desire to know, set one foote of your Compasses, then stretch the other foot to the next East and West line (for that line is your Director) keeping that foot still upon the same line, move your hand and Compasses East or West, as occasion requireth, untill you bring the Compasses to the graduated Meridian, and there that foot of the Compasses which stood upon the place, whose latitude you would know, doth shew the latitude of the same place.

How

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How is the course betwene place and place known?

When there are two places assigned, the course betwene which you desire to know, set one foot of your Compasses upon one of the places, then by discretion consider the lines that lead toward the other place, stretching the other foot of the Compasses to one of those lines, and to that part of the line which is nearest to you, keeping that foot still upon the same line, move your hand and Compasses toward the other place, and see whether the other foot of the Compasses that stood upon the other place, doe by this direction touch the second place, which if it doe, then that line whereupon you kept the one foot of your Compasses, is the course betwene those places: but if it touch not the place, you must by discretion search untill you finde a line, whereupon keeping the one foot of the Compasses, will lead the other foot directly from the one place to the other, for that is the course betwene those two places,

How is the distance of places found upon the Chart?

If the places be not farre asunder, stretch a paire of Compasses betwene them, setting the one foot of the Compasses upon one of the places, and the other upon the other place, then not altering the Compasses, set them upon the graduated Meridian of your Chart, and allowing 20 leagues for every degree that is contained betwene the two feet of your Compasses, the distance desired is thereby knowne: if betwene the places there be five degrees, then they are 100 leagues asunder, &c. But if the distance betwene the places be so great, as that the Compasses cannot reach betwene them, then take out five degrees with your Compasses, which is 100 leagues, and therewith you may measure the distance as practise will teach you. There is also in every Chart a scale of leagues laid downe, whereby you may measure distances, as is commonly used.

How doth the Pilot order these matters, thereby to conduct his Ship from place to place.

The Pilot in execution of this part of Navigation, doth with carefull regard, consider three especiall things, whereupon the skill practises are grounded.

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1 Of which the first is, the good obseruation of his latitude, which how it may be knowne is before sufficiently exprest.

2 The second is a carefull regard of his Steredge, with very diligent examination of the truth of his Compasse, that it be without variation or other impediments.

3 And the third is a carefull consideration of the number of leagues, that the Ship shal leaue in every houre or watch, to the neereſt estimation that poſſibly he can giue, for any two of these three practises being truly giuen, the third is thereby likewise knowne.

As by the Coſe and height the diſtance is manifeſted, by the diſtance and Coſe the height is knowne: by the height and diſtance the Coſe is giuen, of which three things the Pilot hath onely his height in certaine: the Coſe is ſomewhat doubtfull, and the diſtance is but barely ſuppoſed, notwithstanding from his altitude and Coſe he concludeth the truth of his practice, proceeding in this ſort.

First, he conſidereth in what latitude the place ſtandeth from whence he ſhapeth his Coſe, which for an example ſhall be the Lyart ſtanding in 50 degrees of Septentrionall latitude, then directing his Coſe S. W. ſayeth 3 or 4 daies or longer in ſuch thick weather, as that he is not able to make any obſervation of the Poles altitude, in which time he omitteſ not to keepe an accompt how many leagues the Ship hath ſailed upon that Coſe as nere as he can gueſſe, which number of leagues in this example ſhall be 100 according to his iudgement: then having convenient weather, he obſerveth in what latitude he is, and findeth himſelfe to be in 47 degrees, now with his Compaſſes he taketh the diſtance of 100 leagues, which is the quantitie of the Ships runne by his ſuppoſition, and then ſetting one foote of the Compaſſes upon the Lyart, which is the place from whence he began his Coſe, and directly South Weſt from the ſame he ſetteth the other point of the Compaſſes, by the direction of another paire of Compaſſes, in ſuch ſort as Coſes are found, and there he maketh a pycke for the place of his Ships being, according to his reckoning and Coſe.

And now ſearching together it doe agree with his height, (for the height, Coſe, and diſtance muſt all agree together) he findeth that

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that his picke standeth in 46 degrees, 26 minutes; but it should stand in 47 degrees to agree with his obseruation. Therefore perceiving that he hath given the ship too much way, he bringeth his Course and obserbed altitude to agree, and then he seeth that his ship hath sayled but 85 leagues, and there he layeth downe a picke for the true place of his ships being, according to his Course and latitude, so; so by his Course and height he findeth the truth of his distance, and reprobeth his supposed account to the 15 leagues too much: and after this sort he proceedeth from place to place, untill he arrive unto his desired Port: which is a conclusion infallible, if there be no other impediments, (whereof there hath not beene good consideration had) which may breed error, so; from such negligence there may arise many inconveniences.

What may those impediments be?

By experience at the Sea we finde many impediments that so disturbe the expected conclusion of our practice, as that they agree not with the true positions of Art. For, first it is a matter not common to have the winde so beneficiall, as that a ship may saile thereby, betwene any two assigned places upon the direct Course, but that by the contrariety of winds, she may be constrained to traverse upon all points of the Compasse, the nature whereof I have before sufficiently expressed.

Secondly, although the wind may in some sort favour, yet the ship may have such a Leeward condition, as that shee may make her way 2 or 3 points from her capping.

Thirdly, the sterage may be so disorderly handled, as that there by the Pilot may be abused.

And lastly, the Compasse may be so turled, as that the Pilot may likewise thereby be drawn into error, at all which things, and many moe, as the nature of his sayling, whether before the wind, quartering, or by a Bowling, or whether with lofty or low sayles, with the benefits or hinderances of the Sea, tydegates, streames, and forced let thereof, &c. Of all which things (I say) the skillfull Pilot must have carefull consideration, which are better learned by practice, then taught by precept, so; it is not possible that any man can bee a good and sufficient Pilot as skillfull

Seaman,

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Seaman, but by painfull and diligent practise, with the assistance of Art, whereby the famous Pilot may be esteemed worthy of his Profession as a member meet for the Common-weale.

And now having sufficiently shewed you the ordering of your Chart, for the execution of the skill of Navigation, and being also desirous that you should effectually understand the full nature and use of the same: I thinke it good by a few questions to give you an occasion to exercise your selfe, in the perfect accomplishment of such conclusions as are by this excellent and commodious instrument to be performed.

Necessary questions for the better understanding of the
commodious use of the Chart.

1. Q. If I saile 70 leagues upon the Southwest course, I demand how many degrees I shall lay or depresse the Pole.

A. The difference will be 2 degrees, 30 minutes.

2. Q. If in sailing West Northwest I raise the pole 3 degrees, 30 minutes, I demand how many leagues I have sailed?

A. The distance sailed is 180 leagues.

3. Q. If in sayling 180 leagues betweene West and North, I raise the Pole 3 degrees, I demand upon what Course I have sailed, and how farre I am from the Meridian from whence I began that Course?

A. The Course sailed is Northwest by West, and the distance from the Meridian is 90 leagues.

4. Q. If in sayling 154 leagues I be 80 leagues West from the Meridian, from whence I began my Course, I demand upon what point of the Compass I have sailed, and how much I have raised the Pole?

A. The Course is Northwest by North, and the Pole is raised 6 degrees.

5. Q. If I saile Northwest untill I be 50 leagues from the Meridian, where I began my Course: I demand how many leagues I have sailed, and how much the Pole is raised?

A. The distance sailed is 71 leagues, and the Pole is raised 2 degrees, 32 minutes.

6. Q. If

6. Q. If in sayling **W.** **S. W.** I doe in 30. houres raise 2. degrees, how many degrees should I have raised the Pole, if the same motion had bene North and by West?

A. You should have raised 5. degrees.

7. Q. A ship sayling towards the West, for every 80. leagues that she sayleth in her Course, she departeth from the Meridian from whence she began the same Course 45. leagues, I demand upon what point of the Compass, and how many leagues she hath sayled, in raising the pole 5. degrees.

A. She hath sayled South-west by North 110. leagues.

8. Q. A Pilot sayling toward the West 100. leagues, hath forgotten his Course, yet thus much he knoweth, that if he had sayled upon such a course, as that in 100. leagues sayling he should have raised the pole 3. degrees, he should then have bene twice as farre from the Meridian as now he is, and should also have bene 4. degrees further to the Southward then now he is, I would now know what course he hath sayled, how many leagues, and how farre he is separated from the Meridian, from whence he began the said Course.

A. He hath sayled 85. leagues South-west by West, and is 23. leagues from the Meridian nearest.

9. Q. Two ships departing from one place, the one sayling 145. leagues towards the West, hath raised the pole 4. degrees, and the other hath raised the pole 7. degrees, and is 55. leagues West from the Meridian of the place from whence he began his course, I demand by what course the said ship hath sayled, and how far they be asunder, and by what course they may meet.

A. The first ship hath sayled South-west by West, the second hath sayled South-west by North 170. leagues, they are asunder 65. leagues, and the course between them is North Northeast, and South South-west.

10. Q. Two ships sayling from one place, the one in sayling 185. leagues, is to the Eastward of the Meridian where he began his course 150. leagues, I demand upon what course, and how many leagues the other ship hath sayled, to bring himselfe 50. leagues **S.** by **W.** from the first ship.

A. The first ship hath sayled **S.** by **E.** and hath raised the pole 5. degrees, the second ship must sayle Northeast by North 137. leagues.



Although it may seeme (to some that are very expert in Navigation) that these questions are needlesse, and without use, being so plaine as not deserving in this sort to be published, notwithstanding that their opinion, I doe in friendly carter sic advise all young practisers of this excellent Art of Sayling, that they doe not onely by their Charts prove the truth of these answered questions, but also endeavour themselves to propound divers other sorts of questions, and in seeking their answers, to enquire in the reason thereof: for by such exercise, a young beginner shall understand the substantiall grounds of his Chart, and grow perfect therein: for whose ease and furtherance onely, I have at this present published this brief treatise of Navigation, knowing that the expert Pilot is not unfurnished of these principles, but very little helpe doth greatly further in every beginning: and therefore for the further benefit of the practiser, I have hereunto annexed a particular Sea Chart of our Channel, commonly called the sleeve, by which all that is before spoken touching the use of the Chart, may be practised, wherein the depths of the Channell are truly layd downe: being an instrument most commodious and necessary for all such as seeke the Channell comming out of the Ocean Sea, much of it is from my owne practise, the rest from Pilots of very good sufficiencie: I have found great certainty by the use of this Chart, for by the altitude and depth I have not at no time missed the true notice of my Ships being, which (through Gods mercifull favour) by my lands falls I have found alwaies to be without terrour, therefore have it not in light regard, for it will give you great evidence,

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evidence, and is worthy to be kept as a special jewel
for the Seamans use, be he never so expert.

And thus having sufficiently expressed all the pra^{ti}ses
appertaining to the skill of Horizontall Navigation,
which kinde of sayling is now of the greatest sort onely
pra^{ti}sed, I think it good for your better memory, briefly
to report that which before is spoken as touching this
kinde of Navigation, and withall it will not be amisse to
shew you after what sort I have beene accustomed to
keepe my accounts in my pra^{ti}ses of sayling, which you
shall finde to be very sure, plaine, and easie, whereby you
may at all times examine what is past, and so reforme the
causes laid downe upon the Chart, if by chance there
should any errour be committed. And so concluding this
part of Navigation, will in the next treatise make known
unto you the use of the Globe, such uses I meane as the
Seaman may pra^{ti}se in his voyages, and that are most
necessary for his knowledge.

Longitude	Latitude	Distance	Time	Speed
10	10	10	10	10
20	20	20	20	20
30	30	30	30	30
40	40	40	40	40
50	50	50	50	50
60	60	60	60	60
70	70	70	70	70
80	80	80	80	80
90	90	90	90	90
100	100	100	100	100
110	110	110	110	110
120	120	120	120	120
130	130	130	130	130
140	140	140	140	140
150	150	150	150	150
160	160	160	160	160
170	170	170	170	170
180	180	180	180	180
190	190	190	190	190
200	200	200	200	200
210	210	210	210	210
220	220	220	220	220
230	230	230	230	230
240	240	240	240	240
250	250	250	250	250
260	260	260	260	260
270	270	270	270	270
280	280	280	280	280
290	290	290	290	290
300	300	300	300	300

A Table

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A Table shewing the order how the Seaman may keepe his Accounts, whereby he may at all times distinctly examine his former practice, for in every 24. houres, which is from noon to noon, he doth not once ly downe in a stude, with the course and leagues; but also how the wind hath blowne in the same time.

The first Column is the months and dayes of the same, the second is the observed altitude, the third is the Horizon all course of motion of the Ship, the fourth the number of leagues that the Ship hath sailed, the fifth is a space where must be noted, by what wind these things have beene performed, and the next great space is to lay down any briefe discourse for your memory.

Anno. 1593.									
Months and dayes of the moneth.		Latitude.		Course.		Leagues.		Wind.	
The 2. of March									
March. 24		7	30	N. N. E.	29	East.	101	Yall.	Compass varied
25		5	44	N. b. E. nor.	36	E. b. N.	9	deg.	the South
26		4	1	N. b. N.	35	E. b. N.	point	westward.	Compass varied
27		2	49	N.	24	E. b. N.	8 d.	the South	point westward.
28		1	31	N. e. s. rly.	26	E. o. N.			
29		1	4	N. N. W.	9	N. E.			
April. 31		0	0	N. b. W.	21	E. N. E.	Compass varied	6. d. 40. m.	the
4		0	30	N. W. b. N.	15	N. E.	South point	west-	ward.
7		1	53	N. N. W.	28	N. E.	Observation,	the	
olds T 9		3	5	N. W. b. N.	30	N. e. b. e.	Pole arick	above	the Horizon.
10		4	5	N. W. b. N.	22	N. e.			
11		4	45	N. w.	18	N. e. b. N.			
12		5	16	N. W.	14	N. e. b. N.	Compass varied	7. d.	the North
13		6	11	N. W. b. N.	23	N. e.	point	Eastward.	
14		7	16	N. W. b. N.	24	N. e.			

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A brief repetition of that which is before spoken.

There are three kinds of Navigation, Horizontall, Parallel, and Sailing upon a great Circle, performed by Cozle and Travers.

A Cozle is the paradoxe line, which is described by the ships motion upon any point of the Compasse.

A Travers is the variation of the ships motion upon every alteration of Cozles.

The Compasse is an artificiall Horizon, by which Cozles and Traverses are directed and contained, 12 points, and every point containeth $11\frac{1}{2}$ degrees, or 45 minutes, being $\frac{1}{2}$ of an hour.

By such quantitie of time as the Sonne separateth her selfe from the Sunne, by the like rate of time every tide doth one differ from another.

In every hour the tide altereth two minutes, in every flood twelve minutes, and in every ebbe twelve minutes, and in every day 48 minutes, because that so is the Sonnes separation from the Sunne: for the Sonne doth separate her selfe from the Sunne, in every day one point and 30 minutes, betwixt the change and the full she is to the Eastwards of the Sunne, and then is her separation; at which time she is before the Sunne in respect of her naturall motion, but in regard of her violent motion, she is then behinde or abaft the Sunne.

Betweene the full and change, she is to the westward of the Sunne; applying towards the Sunne, and then is her application, at which time she is behinde or abaft the Sunne, in respect of her naturall motion, but in consideration of her violent motion, she is then before the Sunne.

She hath a violent motion, a naturall motion, a slow, swift and meane motion.

In every 27. dayes and 8. houres, she perfozmeth her naturall motion through the Zodiac.

Betweene change and change there is twenty nine dayes twelve houres, so that foure minutes are left.

The Solar yeare consisteth of 12. monthes, and the lunar yeare of 12. Moones.

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The Sunnes age is found by the Equat.

All Instruments used in Navigation, of what Shape or forme soever they be, are described or demonstrated upon a Circle, or some portion of a Circle, and therefore are of the nature of a Circle.

A degree is the 360. part of a Circle, how bigge or little soever the Circle be.

A degree is applyed after the 6. severall sorts, to the Equator, to the Meridian, to the Horizon, to the verticall Circle, to measure, to time.

Altitude is the distance, height, or mounting of one thing above another.

The Poles altitude is the distance betwene the Pole and the Horizon, or the portion of the Meridian which is contained betwene the Pole and the Horizon.

The altitude of the Sunne about the Horizon, is that portion of the verticall circle, which is contained betwene the Horizon and the Sun.

Latitude, is that arke of the Meridian which is contained betwene the parallel of any place and the Equator, or that part of the Meridian which is included betwene the Zenith and the Equinoctiall.

Longitude, is that portion of the Equator contained betwene the Meridian of S Mibela, one of the Isles of the Affores, and the Meridian of the place whose longitude is desired: the reason why the account of longitude both begin at this Ile, is because that there the compasse hath no varietie, for the Meridian of this Ile passeth by the poles of the world, and the poles of the Magnet, being a Meridian proper to both poles.

The longitude betwene place and place, is the portion of the Equator, which is contained betwene the Meridian of the same places.

Declination is the distance of the Sunne, Moone, and Starres, from the Equinoctiall, or that part of the Meridian which passeth by the Center of any celestiaall body, and is contained betwene the same center and the Equinoctiall.

Hydrography is the description of the Ocean Sea, with all Isles, banks, rocks, and sands therein contained, whose limits extend

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extend to the Geographickall borders of the earth, the perfect notice whereof is the chiefest thing required in a sufficient pilot, in his excellent practise of Sailing.

Geography is the description of the earth onely, whereby the terrestriall forme in his due situation is given whose distinction is by mountaines, rivers, vallies, cities, and places of fame, without regard of Circles, Climats, and Zones.

Cosmography is the description of the heavens, with all that is contained within the circuite thereof, but to the purpose of Navigation, we must understand Cosmography to be the universall description of the terrestriall Globe, distinguished by all such circles, by which the distinction of the celestiaall Sphere is understood to be given, with every Country, Coast, Sea, Harborow, or other place seated in their due longitude, latitude, Zone, and Climate.

The Chart is a speciall instrument in Navigation, pretending the Cosmographickall description of the terrestriall Globe, by all such lines, circles, coastes, and divisions as are required to the most exquisite skill of Navigation.

The end of the First Booke.